ENERGY ENGINEERING ANALYSIS PROGRAM

AT

FORT LEAVENWORTH, KANSAS

FINAL SUBMITTAL

ENERGY SAVINGS OPPORTUNITY SURVEY EXECUTIVE SUMMARY

CONTRACT NUMBER DACA41-86-C-0061

JUNE 4, 1990



KANSAS CITY DISTRICT CORPS OF ENGINEERS

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INTRODUCTION

A. General Description

Fort Leavenworth is located in Northeastern Kansas on approximately 6,000 acres of land. Approximately 2000 acres have been developed and maintained. Included in the Fort grounds are Sherman Army Air Field and the United Stated Disciplinary Barracks.

B. Purpose of Report

The purpose of this report is evaluate selected Energy Conservation Opportunities and provide programming or implementation documentation for all recommended ECO's.

After the individual ECO's were calculated, those projects with SIR's greater than 1 were grouped into projects for funding. Form 4283, Facilities Engineering Work Request was filled out for each project grouping. Projects meeting ECIP requirements have PDB's and Form 1391 documentation.

C. Computer Programs

A number of computer programs were used to aid in the calculation of energy savings, construction cost estimates and other government forms. For the energy analysis of some ECO's, we used "Energy Plus - Energy Use and Load Analysis" by Computer Design Software Company. This program uses the Hour-by-Hour method for calculating heating and cooling energy as presented in Chapter 25 of the ASHRAE Handbook of Fundamentals. Simple energy savings are calculated by standard methods or with the ASHRAE modified temperature bin methods using standard spreadsheet computer program. Bell Hall used "PC-DOE", a microcomputer version of DOE-2.1B energy analysis program. The "Life Cycle Cost in Design (LCCID) Economic Analysis Computer Program" by

EXECUTIVE SUMMARY

the Government thru the University of Illinois is used for life cycle cost analysis calculations.

D. Observations

In general, inadequate preventive maintenance of the Fort Leavenworth facilities is the cause of a significant amount of wasted energy. Although lighting and architectural maintenance are, in general, adequate, maintenance of mechanical equipment, especially controls, is not adequate due to a shortage of maintenance personnel.

In the past, mechanical maintenance for most HVAC systems has been on a "replace on breakdown" schedule. Time clocks, thermostats, mixed air controls, night setback and outdoor air temperature reset controls were either disconnected or malfunctioning. Currenty there is a comitment to do preventitive maintenance, however an infusion of funds is necessary to help correct current problems that are beyond the scope of regular maintenance work. Once these projects have been completed, maintenance personel should be able to keep up with a preventitive maintenance program.

EXISTING ANNUAL ENERGY CONSUMPTION

BUILDING		ELECTRICITY	ı		NATURAL GAS			TOTAL
NAME	KWH	DOLLARS	MBTU	THERMS	DOLLARS	MBTU	DOLLARS	MBTU
BUILDING #25							_	
WATER TREATMENT	84.969	\$4,495	290	5.48E-09	\$1.726	548	\$6,221	<u>838</u>
BUILDING #48	007.047	447.040	4 440	4 455 00				
EM BARRACKS BUILDING #50	327.947	\$17.349	1.119	1.45E-08	\$4.577	1.453	\$21.926	2.572
DATA PROCESSING	131,969	\$6,981	450	0.00E+00	\$o	ol	\$6,981	450
BUILDING #52	101.000	- VO.301	730	0.002400		Y	WO.301	700
CACDA, CAORA	1,430,708	\$75,687	4.883	5.93E-08	\$18,668	5.927	\$94,355	10,810
BUILDING #56								
POST CHAPEL	444,792	\$23,530	1,518	3.99E-08	\$12,576	3,992	\$36,106	5,510
BUILDING #77								
MEDIA CENTER	363.024	\$19,205	1.239	1.05E-08	\$3,298	1.047	\$22,503	2,286
BUILDING #102 FINANCE	184.360	£0.750		4.055.00	65 400	4 646	644.045	0.070
BUILDING #136	184.360	\$9,753	629	1.65E-08	\$5,193	1.648	\$14,945	2,278
COMMUNICATIONS	5,442,469	\$287.915	18,575	5.42E-08	\$17,074	5,420	\$304,989	23,996
BUILDING #225	0.442.400	V.C07.010	10.070	0.426-00	W17.073	J.720	\$ \$\$\$7,509	20,990
BOO, & DINING	315,558	\$16,694	1,077	6.11E-09	\$1,925	611	\$18.618	1.688
BUILDING #318								
OFFICERS CLUB	125,696	\$6,650	429	6.57E-09	\$2.070	657	\$8,719	1.086
BUILDING #345								
PATCH CENTER BUILDING #398	138.427	\$7,323	472	3.30E-08	\$10.397	3.301	\$17.720	3,773
DB GREENHOUSE	200,436	\$10,603	684	5.12E-09	\$1.613	512	\$12.216	1.100
BUILDING #429	200.400	\$10.000	004	3.125-09	31.013	215	312.610	1,196
DB BARRACKS	330,101	\$17,463	1,127	2.93E-08	\$9,233	2.931	\$26,696	4.058
BUILDING #470					*****			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
DB VOC SHOPS	249,225	\$13,184	851	1.78E-08	\$5,594	1,776	\$18,778	2,626
BUILDING #1008								
LPU BARRACKS	107.823	\$5,704	368	6.61E-09	\$2.082	661	\$7.786	1.029
BUILDING #1009 LPU MESSHALL	54,205	\$2.868	185	5.23E-09	\$1,647	523	\$4,515	708
AFH - VESTIBULES	34,203	92.000	100	5,23E-09	\$1,047	523	\$4,515	708
11-19 ONLY	58.178	\$3.078	199	9.82E-09	\$3.093	982	\$6,171	1,180
AFH - ENTRY DOOR				7.02.0	30.000	302	• • • • • • • • • • • • • • • • • • • •	,,100
11-19 ONLY	135,177	\$7,151	461	2.28E-08	\$7,187	2,282	\$14,338	2,743
AFH - PATIO DOOR								
11-19 ONLY	170.524	\$9,021	582	2,89E-08	\$9,110	2,892	\$18,131	3,474
USDB OVERALL	61,324	\$3.244	209	0.00E+00	\$0	0	\$3,244	209
		A						
TOTAL	10,356,910	\$547,896	35,348	3.72E-07	\$117,064	37,163	\$664,960	72,51

EXPLANATION OF ECO'S

MECHANICAL

ECO M1. Economizer Cycles (Dry Bulb)

The economizer functions by using outside air for cooling when the outdoor air temperature is low enough to provide cooling for the building. (Approx. 65°F)

ECO M2. Prevent Air Stratification

Air stratification occurs when warm air rises to the ceiling of a room or building leaving the lower half of the room cooler than the top half. The heating system is usually controlled by a thermostat in the lower portion of the space, and keeps running even though the average temperature of the space might be satisfactory.

ECO M3. Boiler O2 Trim Control

Adjusting the amount of oxygen to the exact needs of the boiler combustion device will reduce the amount of excess air used during combustion. Since this excess air is heated during combustion, any reduction in air will save energy.

ECO M4. Upgrade Boiler Controls

Upgrading boiler controls will increase efficiency and allow such features as water temperature reset to be incorporated.

ECO M5. Insulate Steam Lines

In areas where insulation on steam lines is missing or inadequate the lines may be re-insulated to reduce the amount of heating energy lost.

ECO M6. Return Condensate

If condensate is not returned to the boiler, the hot condensate is lost and the make-up water is heated from near room temperature to the boiler set point. Currently, there are no areas where condensated is purposly dumped. Some leaks and malfunctioning systems exist, but they are under repair or scheduled for repaire.

ECO M7. Upgrade Building HVAC Controls

Upgrading building HVAC controls involves remodeling or replacing the controls to improve operational characteristics and efficiency. Many existing controls are old and/or malfunctioning and should be replaced.

ECO M8. Steam Trap Program

Steam traps are devices that consistently fail, and are designed to be easily replaceable and repairable. These devices need to be regularly checked and replaced for maximum system efficiency.

ECO M9. Air Curtains

Air curtains located at loading dock doors prevents outside air from entering the building, thus reducing heating and cooling energy due to infiltration.

ECO M10. Infra-red Heaters

Infra-red heaters save energy by directing heat where it is required on surfaces, and not heating air unnecessarily. They are especially useful in factories, warehouses and greenhouses where there are few personnel.

ELECTRICAL

ECO E1. Energy Saving Fluorescent

Energy saving fluorescent lighting saves approximately 30 watts per fixture (4-lamps, 2-ballasts), vs a standard fixture. All of the replacement lamps are currently energy saving lamps.

ECO E2. Reduce Lighting Levels

Reducing lighting levels would reduce the number of watts used to light a particular room. However, reduction in lighting levels must be carefully considered for each application because lighting levels affect worker performance and moral.

ECO E3. Replace Incandescent Lamps

Replacing incandescent lamps with more efficient lighting sources can save a significant amount of energy without reducing light levels. However, in some cases, the atheistic value of the lighting quality needs to be considered.

ECO E4. High efficiency Motor Replacement

Electrical energy can be saved by installing high efficiency motors in place of standard motors. The high efficiency motor delivers the same horsepower, but uses less electrical energy.

ECO E5. Improve Electrical Power Factor

If the power company charges a penalty for a low power factor. Improving electrical power factor will reduce the power company penalty. At Fort Leavenworth the power company does not charge for a low power factor.

ARCHITECTURAL

ECO A1. Insulation

Insulation of buildings includes the addition of roof, attic, and wall insulation. Most buildings had substandard insulation, however, insulation is expensive to install in retrofit applications and is seldom cost effective unless credit can be taken for construction costs required by renovation and or replacement based on factors other than energy savings.

ECO A2. Thermopane Glass

Thermopane Glass is hermetically sealed with an air gap between two panes of glass. The glass has very good insulating qualities, however, it is expensive to install and will not usually provide a short payback unless new windows are already required.

ECO A3. Weatherstrip/Caulk

Weatherstripping and Caulking is a low cost solution to the problem of excessive infiltration thru loose windows, doors etc.. Generally weatherstripping and caulking can be done by Post personnel.

ECO A4. Solar Film

Solar film can be added to window glazing to reduce the amount of sunlight and heat entering the building during the cooling season. A increase in heating energy may be required to offset reduced solar gain in the winter.

ECO A5. Vestibules

Vestibules reduce energy consumption by limiting the amount of outside air infiltration into buildings thru frequently used doors.

ECO A6. Reduce Glass Areas

Removing unnecessary windows and infilling the opening with wall material, can significantly reduce the heat loss or gain thru that section of wall.

ECO A7. Loading Dock Seals

Loading dock seals operate similar to vestibules. They reduce air infiltration when loading dock doors are open to the outside by sealing around the truck being unloaded.

ALL ECOs INVESTIGATED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
ECONOM	IIZER CYCLES	I WIBTO S/TH	(Φ)			12/110 1	
ECONON	BUILDING #56						
M1	POST CHAPEL	58.0	\$903	\$5,092	\$5,601	6.2	1.47
M1	BUILDING #102 FINANCE	16.0	\$255	\$9,351	\$10,286	40.3	0.23
AIR STRA	ATIFICATION CONTROL	1					
M2	BUILDING #52 CACDA, CAORA	83.0	\$261	\$19,082	\$20,990	80.4	0.17
1012	BUILDING #56	30.0	425,				
M2	POST CHAPEL	38.0	\$120	\$1,963	\$2,159	18.0	0.76
	BUILDING #56	000	# 400	ec 700	\$6,360	53.0	0.26
M2	POST CHAPEL(FANS)	38.0	\$120	\$5,782	\$0,300	55.0	0.20
BOILER (OXYGEN TRIM CONTROL			<u></u>			
МЗ	BUILDING #72 BOILER PLANT		atualu Dullalia	g 72 is being phased o	- LIP		
IVIO	BUILDING #225	Dropped from	Study - Buildin	g 72 is being phaseo (Jut.		
МЗ	BOQ DINNING	346.0	\$1,091	\$10,209	\$11,230	10.3	1.32
UPGRAD	DE BOILER CONTROLS IBUILDING #56	Τ					
M4	POST CHAPEL	13.0	\$41	\$2,672	\$2,939	71.7	0.19
	BUILDING #345						
M4	PATCH COMM. CNTR.	NOT RECOM	MENDED - EX	ISTING CONTROLS	ARE ADEQUA	TE	
	BUILDING #56	600.0	¢4 005	642.610	\$47,971	24.2	0.56
M4A	POST CHAPEL BUILDING #345	630.0	\$1,985	\$43,610	\$47,9 <u>71</u>	24.2	0.50
M4A	PATCH COMM. CNTR.	523.0	\$1,647	\$41,384	\$45,522	27.6	0.49
INSULAT	E STEAM LINES		r			T	
M5	BUILDING #72 BOILER PLANT	lo	1	1			
		- II Jropped trom	study - Buildin	ig 72 is being phased i	out.		
1	BUILDING #102	Dropped from	study - Buildin	g 72 is being phased	out.		
M5	BUILDING #102 FINANCE	216.3		g 72 is being phased \$923	out. \$1,015	1.5	9.10
	BUILDING #102 FINANCE BULDING #470	216.3	\$682	\$923	\$1,015		
M5 M5	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS		\$682			1.5	9.10 7.79
	BUILDING #102 FINANCE BULDING #470	216.3	\$682 \$124	\$923	\$1,015		
M5 M5	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL	216.3 39.3 78.5	\$682 \$124 \$248	\$923 \$196 \$393	\$1,015 \$216 \$432	1.7	7.79 7.77
M5	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009	216.3 39.3	\$682 \$124 \$248	\$923 \$196	\$1,015 \$216	1.7	7.79
M5 M5 M5	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL	216.3 39.3 78.5	\$682 \$124 \$248	\$923 \$196 \$393	\$1,015 \$216 \$432	1.7	7.79 7.77
M5 M5 M5	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL	216.3 39.3 78.5	\$682 \$124 \$248	\$923 \$196 \$393 \$9,533	\$1,015 \$216 \$432 \$10,486	1.7 1.7 2.3	7.79 7.77 6.02
M5 M5 M5	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS	216.3 39.3 78.5	\$682 \$124 \$248 \$4,658	\$923 \$196 \$393	\$1,015 \$216 \$432	1.7	7.79 7.77
M5 M5 M5 UPGRAD	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52	216.3 39.3 78.5 1479.0 290.3	\$682 \$124 \$248 \$4,658 \$4,364	\$923 \$196 \$393 \$9,533 \$8,877	\$1,015 \$216 \$432 \$10,486 \$9,765	1.7 1.7 2.3	7.79 7.77 6.02 4.10
M5 M5 M5 UPGRAD	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS	216.3 39.3 78.5 1479.0	\$682 \$124 \$248 \$4,658 \$4,364	\$923 \$196 \$393 \$9,533	\$1,015 \$216 \$432 \$10,486	1.7 1.7 2.3 2.2 0.7	7.79 7.77 6.02 4.10
M5 M5 M5 UPGRAD	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL	216.3 39.3 78.5 1479.0 290.3	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877	\$1,015 \$216 \$432 \$10,486 \$9,765	1.7 1.7 2.3	7.79 7.77 6.02 4.10
M5 M5 M5 UPGRAD M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169	1.7 1.7 2.3 2.2 0.7 3.0	7.79 7.77 6.02 4.10 13.64 4.00
M5 M5 M5 UPGRAD M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE	216.3 39.3 78.5 1479.0 290.3 3723.8	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265	1.7 1.7 2.3 2.2 0.7	7.79 7.77 6.02 4.10
M5 M5 M5 UPGRAD M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169	1.7 1.7 2.3 2.2 0.7 3.0	7.79 7.77 6.02 4.10 13.64 4.00
M5 M5 M5 UPGRAE M7 M7 M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7 862.7 3913.7	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275 \$27,683	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169 \$10,203 \$30,451	1.7 1.7 2.3 2.2 0.7 3.0 2.1	7.79 7.77 6.02 4.10 13.64 4.00 5.21 8.40
M5 M5 M5 UPGRAD M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345 PATCH CENTER	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7 862.7	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275 \$27,683	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169 \$10,203	1.7 1.7 2.3 2.2 0.7 3.0 2.1	7.79 7.77 6.02 4.10 13.64 4.00
M5 M5 M5 UPGRAD M7 M7 M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345 PATCH CENTER BUILDING #429	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7 862.7 3913.7 448.3	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753 \$23,404 \$2,343	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275 \$27,683 \$9,367	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169 \$10,203 \$30,451 \$10,304	1.7 1.7 2.3 2.2 0.7 3.0 2.1	7.79 7.77 6.02 4.10 13.64 4.00 5.21 8.40
M5 M5 M5 UPGRAE M7 M7 M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345 PATCH CENTER	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7 862.7 3913.7	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753 \$23,404 \$2,343	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275 \$27,683 \$9,367	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169 \$10,203 \$30,451	1.7 1.7 2.3 2.2 0.7 3.0 2.1 1.3 4.4	7.79 7.77 6.02 4.10 13.64 4.00 5.21 8.40
M5 M5 M5 UPGRAD M7 M7 M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345 PATCH CENTER BUILDING #429 DB BARRACKS BUILDING #470 DB VOC SHOPS	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7 862.7 3913.7 448.3 413.0	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753 \$23,404 \$2,343 \$2,204	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275 \$27,683 \$9,367	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169 \$10,203 \$30,451 \$10,304 \$8,528	1.7 1.7 2.3 2.2 0.7 3.0 2.1 1.3 4.4 3.9	7.79 7.77 6.02 4.10 13.64 4.00 5.21 8.40
M5 M5 M5 M7 M7 M7 M7 M7 M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345 PATCH CENTER BUILDING #429 DB BARRACKS BUILDING #470 DB VOC SHOPS BUILDING #1008	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7 862.7 3913.7 448.3 413.0 NOT RECOM	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753 \$23,404 \$2,343 \$2,204 MENDED - CO	\$923 \$196 \$393 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275 \$27,683 \$9,367 \$7,753	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169 \$10,203 \$30,451 \$10,304 \$8,528 Y REPLACED	1.7 1.7 2.3 2.2 0.7 3.0 2.1 1.3 4.4 3.9	7.79 7.77 6.02 4.10 13.64 4.00 5.21 8.40
M5 M5 M5 WPGRAE M7 M7 M7 M7 M7 M7 M7	BUILDING #102 FINANCE BULDING #470 DB VOC. SHOPS BUILDING #1009 LPU MESSHALL USDB OVERALL DE HVAC CONTROLS BUILDING #48 EM BARRACKS BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345 PATCH CENTER BUILDING #429 DB BARRACKS BUILDING #470 DB VOC SHOPS	216.3 39.3 78.5 1479.0 290.3 3723.8 919.7 862.7 3913.7 448.3 413.0 NOT RECOM	\$682 \$124 \$248 \$4,658 \$4,364 \$36,638 \$4,068 \$4,753 \$23,404 \$2,343 \$2,204 MENDED - CO	\$923 \$196 \$393 \$9,533 \$9,533 \$8,877 \$23,877 \$11,063 \$9,275 \$27,683 \$9,367 \$7,753	\$1,015 \$216 \$432 \$10,486 \$9,765 \$26,265 \$12,169 \$10,203 \$30,451 \$10,304 \$8,528 Y REPLACED	1.7 1.7 2.3 2.2 0.7 3.0 2.1 1.3 4.4 3.9	7.79 7.77 6.02 4.10 13.64 4.00 5.21 8.40

^{*} TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

ALL ECOs INVESTIGATED

ECO	BUILDING	ENERGY	ENERGY	CONCEDUCTION	TOTAL	SIMPLE	SIR
200	NAME	SAVINGS MBTU'S/YR	SAVINGS (\$)	CONSTRUCTION COST	PROJECT COST*	PAYBACK YEARS	SIR
CTEAN							
SIEAMI	TRAP PROGRAM TA. OWNER TESTING						
M8	PER 100 TRAPS.	2467.0	\$7,771	\$12,000	\$13,200	1.7	6.19
M8	B. SERVICE TESTING PER 100 TRAPS.	2467.0	\$7,771	\$4,350/YR	\$4785/YR	0.6	142.41
ALD CLID	TAINC						
AIR CUR	BUILDING #470						
M9	DB VOC SHOPS	31.0	\$98	\$2,231	\$2,454	25.0	0.54
NFRARE	ED HEATING						
M10	BUILDING #398 DB GREENHOUSE	439.0	\$2,050	\$39,272	\$43,199	21.1	0.80
		1 439.0	\$2,030	φ 39,272	φ45,199 [21.11	0.00
<u>ENERGY</u>	SAVING FLUORESCENT					· · · · · · · · · · · · · · · · · · ·	
E1	BUILDING #50 DATA PROCESSING	20.3	\$314	\$25,392	\$27,931	89.0	0.14
	BUILDING #52						
<u>E1</u>	CACDA, CAORA BUILDING #56	49.5	\$1,084	\$88,572	\$97,429	89.9	0.12
E1	POST CHAPEL BUILDING #77	44.5	\$732	\$11,291	\$12,420	17.0	0.68
E1	MEDIA CENTER	62.4	\$968	\$58,392	\$64,231	66.4	0.19
E1	BUILDING #102 FINANCE	21.9	\$376	\$9,836	\$10,820	28.8	0.40
	BUILDING #136						
E1	COMMUNICATIONS BUILDING #345	31.7	\$690	\$54,682	\$60,150	87.2	0.13
E1	PATCH CENTER	2.7	\$91	\$6,575	\$7,233	79.5	0.13
<u>E</u> 1	BUILDING #470 DB VOC. SHOPS	16.1	\$409	\$33,248	\$36,573	89.4	0.19
INCANDI	ESCENT LIGHTING						
INCAND	BUILDING #50			<u> </u>			· · · · · · · · · · · · · · · · · · ·
E3	DATA PROCESSING	7.3	\$113	\$184	\$202	1.8	6.57
E3	BUILDING #52 CACDA, CAORA	2.7	\$87	\$537	\$591	6.8	1.57
	BUILDING #56		φ0/	\$337	φ391		
E3	POST CHAPEL BUILDING #77	87.5	\$2,112	\$11,751	\$12,926	6.1	1.79
E3	MEDIA CENTER	26.5	\$411	\$984	\$1,082	2.6	4.46
E3	BUILDING #102 FINANCE	1.0	\$67	\$65	\$72	1.1	9.65
	BUILDING #136						
E3	COMMUNICATIONS BUILDING #345	12.9	\$268	\$442	\$486	1.8	6.15
E3	PATCH CENTER	4.2	\$143	\$349	\$384	2.7	3.91
E3	BUILDING #470 DB VOC. SHOPS	10.7	\$265	\$216	\$238	0.9	12.14
ENERGY	'EFFICIENT MOTORS						- -
	BUILDING #25						
E4	WATER TREATMENT	150.1	\$2,327	\$14,793	\$16,272	7.0	1.68
E4	BUILDING #345 PATCH CENTER	18.9	\$293	\$2,436	\$2,680	9.1	1.28
E4	BUILDING #470 DB VOC. SHOPS	26.7	\$414	\$3.154	\$3,469	8.4	1.40
E4	USDB OVERALL	136.0	\$2,108	\$16,551	\$18,206	8.6	1.36

ALL ECOS INVESTIGATED

	BUILDING	ENERGY	ENERGY		TOTAL	SIMPLE	
ECO	NAME	SAVINGS	SAVINGS	CONSTRUCTION	PROJECT	PAYBACK	SIR
		MBTU'S/YR	(\$)	COST	cost*	YEARS	
101111 477	1011						
INSULATI	BUILDING #56						
A1	POST CHAPEL	740.0	\$3,383	\$85,681	\$94,249	27.9	0.62
A1	BUILDING #136	740.0	Ψ0,000	\$00,001	ψ54,245		0.02
A1	COMMUNICATIONS	6.0	\$19	\$3,403	\$3,743	197.0	0.11
	BUILDING #318						
A1	OFFICERS CLUB	245.0	\$895	\$16,846	\$18,531	20.7	0.92
	BUILDING #345						
<u>A1</u>	PATCH CENTER	377.0	\$1,267	\$28,139	\$30,953	24.4	0.81
١.,	BUILDING #470	157.5	0514	040 770	400.057	40.0	0.50
A1	DB VOC. SHOPS	157.5	\$514	\$18,779	\$20,657	40.2	0.50
A1	BUILDING #1008 IDB BARRACKS	131.0	\$487	\$16,359	\$17,995	37.0	0.51
<u> </u>	BUILDING #1009	131,0	Ф40 7	\$10,339	φ17,995	07.0	- 0.01
A1	DB MESS HALL	81.0	\$294	\$9,775	\$10,753	36.6	0.52
	100 11200 11120		<u> </u>		4 - 11 - 1 - 1		
THERMO	PANE GLASS						
	BUILDING #52						
A2	CACDA, CAORA	620.6	\$1,999	\$143,462	\$157,808	78.9	0.26
	BUILDING #52	1				00.4	0.00
A2_	CACDA, CAORA *A	543.9	\$2,403	\$175,654	\$193,219	80.4	0.22
A2	BUILDING #56 POST CHAPEL	243.1	\$1,335	\$16,014	\$17.615	13.2	1.20
	BUILDING #470	243.1	\$1,333	\$10,014	φ17.013	10.2	1.20
A2	DB VOC. SHOPS	327.7	\$1,041	\$53,116	\$58,428	56.1	0.36
		, 02	• • • • • • • • • • • • • • • • • • • 	<u> </u>	4 1		
WEATHE	RIZATION		•				
	BUILDING #25						
A3	WATER TREATMENT	224.0	\$1,090	\$4,813	\$5,294	4.9	3.43
	BUILDING #52						
A3	CACDA, CAORA	39.2	\$126	\$6,092	\$6,701	53.2	0.38
١ ,,	BUILDING #56	1	****		ΦE 455	6.1	2.34
A3	POST CHAPEL BUILDING #77	123.0	\$893	\$4,959	\$5,455	0.11	2.34
АЗ	MEDIA CENTER	39.0	\$517	\$5,283	\$5,811	11.2	1.08
7,0	BUILDING #136	33.0	Ψ517	ψ5,200	ψο,σ : 1		
А3	COMMUNICATIONS	4.1	\$13	\$1,604	\$1,764	135.7	0.15
	BUILDING #345						
A3	PATCH CENTER	17.8	\$66	\$285	\$314	4.8	3.96
ł _	BUILDING #429						
A3	M P QUARTERS	10.4	\$37	\$5,064	\$5,570	150.6	0.12
۸,	BUILDING #470		640	61.067	61 504	79.1	0.26
A3	DB VOC. SHOPS BUILDING #470	6.0	\$19	\$1,367	\$1,504	73.1	0.20
АЗ	DB VOC. SHOPS *A	86.0	\$271	\$8,950	\$9,845	36.3	0.57
	BUILDING #470	- 60.0	Ψ271	φο,οσο	Ψο,ο το		
А3	DB VOC. SHOPS *B	74.0	\$233	\$29,355	\$32,291	138.6	0.15
	BUILDING #470						
A3	DB VOC. SHOPS *C	114.0	\$359	\$9,396	\$10,336	28.8	0.71
	BUILDING #1008						0.45
A3	DB BARRACKS	130.0	\$621	\$3,866	\$4,253	6.8	2.45
001.45	***						
SOLAR F	BUILDING #52		<u>r</u>	Т	1	I I	
A4	CACDA, CAORA	NOT BECOM	MENDED EV	I ISTING WINDOWS II	I POOR CONE	ITION	
	BUILDING #56	INO THECOM	I INCINDED- EX	ISTING WINDOWS II	I	11.01	
A4	POST CHAPEL	30.0	\$637	\$4,805	\$5,286	8.3	1.34
	BUILDING #225	1 30.0	1	1 ,,,,,,,,,	40,290		
A4	BOQ & DINING	160.3	\$3,926	\$17,076	\$18,784	4.8	2.28
	BUILDING #470						
A4	DB VOC. SHOPS	(\$27)	224	\$2,085	\$2,294	10.2	0.51

VESTIBULES

^{*} TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

ALL ECOS INVESTIGATED

	BUILDING	ENERGY	ENERGY		TOTAL	SIMPLE	
ECO	NAME	SAVINGS	SAVINGS	CONSTRUCTION	PROJECT	PAYBACK	SIR
		MBTU'S/YR	(\$)	COST	cost•	YEARS	
	BUILDING #25						
A5	WATER TREATMENT	166.7	\$525	\$5,799	\$6,379	12.2	4.76
	BUILDING #1008						
A5	D B BARRACKS	VESTIBULES	EXISTING-SE	E A3 FOR NEW DO	ORS		
	BUILDING #1009						
A5	D B MESS HALL	146.3	\$683	\$6,211	\$6,832	10.0	1.70
	AFH - VESTIBULES						
A5	11-19 ONLY	1759.0	\$8,396	\$535,194	\$588,713	70.1	0.24
	AFH - NEW ENTRY DOOR						
A5 .	11-19 ONLY	2915.0	\$13,963	\$605,672	\$666,239	47.7	0.35
	AFH - NEW PATIO DOOR						
A5	11-19 ONLY	3593.0	\$17,152	\$305,126	\$335,639	19.6	0.86
REDUCE	GLASS AREA						
	BUILDING #52						
A6	CACDA, CAORA	67.9	\$298	\$13,987	\$15,386	51.6	0.34
	BUILDING #56						
A 6	POST CHAPEL	63.9	\$767	\$7,167	\$7,884	10.3	1.21
	BUILDING #345						
A6	PATCH CENTER	60.2	\$206	\$913	\$1,004	4.9	4.04
	BUILDING #470						
A6	DB VOC. SHOPS	204.4	\$585	\$49,273	\$54,200	92.7	0.23
	BUILDING AFH						
A6	AREAS 11-19 ONLY	3906.3	\$17,201	\$287,780	\$316,558	18.4	0.95
LOADING	G DOCK SEALS						
	BUILDING #77						
A7	MEDIA CENTER	6.7	\$21	\$5,588	\$6,147	292.7	0.07
	BUILDING #136						
A7	COMMUNICATIONS	8.7	\$26	\$1,645	\$1,810	69.6	0.30

ALL ECOS RECOMMENDED

	BUILDING	ENERGY	ENERGY		TOTAL	SIMPLE	
ECO	NAME	SAVINGS	SAVINGS	CONSTRUCTION	PROJECT	PAYBACK	SIR
		MBTU'S/YR	(\$)	COST	COST*	YEARS	
L		1					
FCONOM	IIZER CYCLES						
l Contoin	IBUILDING #56				T. T		
M1	POST CHAPEL	58.0	\$903	\$5,092	\$5,601	6.2	1.47
1411	I OOT OTTALLE	1 00.01	4500	Ψ0,002	40,007		
DON ED	OXYGEN TRIM CONTROL						
BOILER	BUILDING #225	1		· · · · · · · · · · · · · · · · · · ·			
1	BOQ DINNING	346.0	\$1,091	\$10,209	\$11,230	10.3	1.32
<u>M3</u>	IBOQ DININING	340.0	\$1,091	\$10,209	\$11,2001	10.0	1.02
INICHI AT	E STEAM LINES						
INSULAT	E STEAM LINES TBUILDING #102	1		·			
١			***	#000	61.015	1.5	9.10
M5	FINANCE	216.3	\$682	\$923	\$1,015	1.5	9.10
	BULDING #470						7.70
M5	DB VOC. SHOPS	39.3	\$124	\$196	\$216	1.7	7.79
	BUILDING #1009						
M5	LPU MESSHALL	78.5	\$248	\$393	\$432	1.7	7.77
ļ.					t	1	
M5	USDB OVERALL	1479.0	\$4,658	\$9,533	\$10,486	2.3	6.02
UPGRAD	E HVAC CONTROLS						
	BUILDING #48			1			
M7	EM BARRACKS	290.3	\$4,364	\$8,877	\$9,765	2.2	4.10
	BUILDING #52	250.0	Ψ -,υυ-	Ψο,οι,	40,.00		
M7	CACDA, CAORA	2722.0	\$26.620	\$23,877	\$26,265	0.7	13.64
IVI /		3723.8	\$36,638	\$23,677	φ20,203		10.01
	BUILDING #56			1 000	440400	20	4.00
<u>M7</u>	POST CHAPEL	919.7	\$4,068	\$11,063	\$12,169	3.0	4.00
1	BUILDING #102					24	F 04
<u>M7</u>	FINANCE	862.7	\$4,753	\$9,275	\$10,203	2.1	5.21
	BUILDING #136		İ	1			
M7	COMMUNICATIONS	3913.7	\$23,404	\$27,683	\$30,451	1.3	8.40
	BUILDING #345						
M7	PATCH CENTER	448.3	\$2,343	\$9,367	\$10,304	4.4	<u>2.58</u>
	BUILDING #429						
M7	DB BARRACKS	413.0	\$2,204	\$7,753	\$8,528	3.9	2.92
	BUILDING #1009	1	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<u> </u>			
M7	LPU MESSHALL	253.0	\$1,133	\$622	\$684	0.6	19.74
1417	TEL O MICOOLIACE	200.0	ψ1,100	4022	, , , , , , , , , , , , , , , , , , , 		
STEAM	TRAP PROGRAM						
STEMINI I	B. SERVICE TESTING		r	T	T		
l		0407.0	07.774	44.050.00	\$4785/YR	0.6	142.41
M8	JPER 100 TRAPS.	2467.0	\$7,771	\$4,350/YF	1 34/85/1h	0.0]	142.41
INCANDE	ESCENT LIGHTING		·		· · · · · · · · · · · · · · · · · · ·		
1	BUILDING #50						0.57
E3	DATA PROCESSING	7.3	\$113	\$184	\$202	1.8	6.57
i	BUILDING #52			Ì			
E3	CACDA, CAORA	2.7	\$87	\$537	\$591	6.8	1.57
	BUILDING #56						
E3	POST CHAPEL	87.5	\$2,112	\$11,751	\$12,926	6.1	1.79
	BUILDING #77						
E3	MEDIA CENTER	26.5	\$411	\$984	\$1,082	2.6	4.46
	BUILDING #102	1	1 ***	750	1		
E3	FINANCE	1.0	\$67	\$65	\$72	1.1	9.65
LU	BUILDING #136	1.0	\$67	φ05	Ψ, Ζ		
E3	COMMUNICATIONS	100	6060	\$442	\$486	1.8	6.15
F ₂		12.9	\$268	P442	9400		0.10
	BUILDING #345	1		6040	0204	2.7	3.91
E3	PATCH CENTER	4.2	\$143	\$349	\$384	Z./	3.91
				1		, ,	
E3	BUILDING #470 DB VOC. SHOPS	10.7	\$265	\$216	\$238	0.9	12.14

^{*}TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

ALL ECOS RECOMMENDED

	BUILDING	ENERGY	ENERGY		TOTAL	SIMPLE	· · · · · · · · · · · · · · · · · · ·
ECO	NAME	SAVINGS	SAVINGS	CONSTRUCTION	PROJECT	PAYBACK	SIR
		MBTU'S/YR	(\$)	COST	COST*	YEARS	
ENERGY	Y EFFICIENT MOTORS						
	BUILDING #25						
E4	WATER TREATMENT	150.1	\$2,327	\$14,793	\$16,272	7.0	1.6
	BUILDING #345						
E4	PATCH CENTER	18.9	\$293	\$2,436	\$2,680	9.1	1,2
	BUILDING #470						
E4	DB VOC. SHOPS	26.7	\$414	\$3,154	\$3,469	8.4	1.4
E4	USDB OVERALL	136.0	\$2,108	\$16,551	\$18,206	8.6	1.3
THEDM	OPANE GLASS					-	
IETIVI	BUILDING #56			T			
A 2	POST CHAPEL	243.1	\$1,335	\$16,014	\$17,615	13.2	1.2
		2-0.1	ψ1,000	<u> </u>	1 9.750.0		
WEATH	ERIZATION				r		
	BUILDING #25				45.004		0.4
A3	WATER TREATMENT BUILDING #56	224.0	\$1,090	\$4,813	\$5,294	4.9	3.4
АЗ	POST CHAPEL	123.0	\$893	64.050	\$5,455	6.1	2.3
AS	BUILDING #77	123.0	\$893	\$4,959	\$5,455	0.1	2.0
АЗ	MEDIA CENTER	39.0	\$517	\$5,283	\$5,811	11.2	1.0
	BUILDING #345	05.0	ΨΟΙΙ	φ0,200	ψο,στι	.,,,,	
A3	PATCH CENTER	17.8	\$66	\$285	\$314	4.8	3.9
	BUILDING #1008						
A3	DB BARRACKS	130.0	\$621	\$3,866	\$4,253	6.8	2.4
SOLAR	FILM "						
	BUILDING #56				1		
A4	POST CHAPEL	30.0	\$637	\$4,805	\$5,286	8.3	1.3
	BUILDING #225		1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
A4	BOQ & DINING	160.3	\$3,926	\$17,076	\$18,784	4.8	2.2
VESTIB	ULES						
	BUILDING #25			<u> </u>			
A 5	WATER TREATMENT	166.7	\$525	\$5,799	\$6,379	12.2	4.7
	BUILDING #1009						
<u>A5</u>	D B MESS HALL	146.3	\$683	\$6,211	\$6,832	10.0	1.7
REDUCI	E GLASS AREA						
	BUILDING #56]	
A6	POST CHAPEL	63.9	\$767	\$7,167	\$7,884	10.3	1.2
• •	BUILDING #345						
A 6	PATCH CENTER	60.2	\$206	\$913	\$1,004	4.9	4.0

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ALL ECOs REJECTED

	DIW DWG	I ENERGY I	ENEDOV	T	TOTAL	CIMPLE	
ECO.	BUILDING	ENERGY	ENERGY	CONSTRUCTION	TOTAL PROJECT	SIMPLE PAYBACK	SIR
ECO	NAME	SAVINGS MBTU'S/YR	SAVINGS	CONSTRUCTION	COST*	YEARS	Oii (
	<u> </u>	MDIUS/IN	(\$)	0001 1	0031 1	TEATIO	
CONOM	IIZER CYCLES						
	BUILDING #102						
<u>M1</u>	FINANCE	16.0	\$255	\$9,351	\$10,286	40.3	0.23
ID 070 (ATIFICATION CONTROL						
IR STRA	ATIFICATION CONTROL BUILDING #52	T T					
M2	CACDA, CAORA	83.0	\$261	\$19,082	\$20,990	80.4	0.17
1012	BUILDING #56	00.0	ΨΕΟΙ	9.10,002	<u> </u>		
M2	POST CHAPEL	38.0	\$120	\$1,963	\$2,159	18.0	0.76
	BUILDING #56						0.00
M2	POST CHAPEL(FANS)	38.0	\$120	\$5,782	\$6,360	53.0	0.26
Oli ER (OXYGEN TRIM CONTROL						
<u>OILLII</u>	BUILDING #72						
МЗ	BOILER PLANT	Dropped from	study - Buildin	g 72 is being phased	out.		
PGRAD	E BOILER CONTROLS						
114	BUILDING #56	1	•	40.070	\$2.939	71.7	0.19
M4	POST CHAPEL BUILDING #345	13.0	\$41	\$2,672	\$2,939	/ !-/	0.13
M4	PATCH COMM. CNTR.	NOT BECOM	MENDED - EX	ISTING CONTROLS	ARE ADEQUA	TE	
	BUILDING #56	THE THE OWN	VICINOLD EX				
M4A	POST CHAPEL	630.0	\$1,985	\$43,610	\$47,971	24.2	0.56
	BUILDING #345						
M4A	PATCH COMM. CNTR.	523.0	\$1,647	\$41,384	\$45,522	27.6	0.49
NCIII AT	TE OTE ARE I INICO						
VSULAI	TE STEAM LINES BUILDING #72			I			
M5		Dropped from	i study - Buildin	I on 72 is being phased	out		
M5	BOILER PLANT	Dropped from	study - Buildir	ig 72 is being phased	out.		
		Dropped from	study - Buildir	ig 72 is being phased	out.		
PGRAD	BOILER PLANT DE HVAC CONTROLS BUILDING #470						
	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS			g 72 is being phased			
JPGRAD M7	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008	NOT RECOM	MENDED - CO	 DNTROLS RECENTL 	Y REPLACED		
JPGRAD	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS	NOT RECOM	MENDED - CO		Y REPLACED		
JPGRAD M7 M7	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS	NOT RECOM	MENDED - CO	 DNTROLS RECENTL 	Y REPLACED		
M7	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS	NOT RECOM	MENDED - CO	 DNTROLS RECENTL 	Y REPLACED		
M7	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS	NOT RECOM	MENDED - CO MENDED - CO	 DNTROLS RECENTL 	Y REPLACED		0.5
M7 M7 MR CUR	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS	NOT RECOM	MENDED - CC MENDED - CC	 DNTROLS RECENTL DNTROLS RECENTL	Y REPLACED Y REPLACED		0.5
M7 M7 MR CUR	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING	NOT RECOM	MENDED - CC MENDED - CC	 DNTROLS RECENTL DNTROLS RECENTL	Y REPLACED Y REPLACED		0.5
M7 M7 M7 MR CUR M9	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398	NOT RECOM NOT RECOM 31.0	MENDED - CO MENDED - CO \$98	DNTROLS RECENTL DNTROLS RECENTL \$2,231	Y REPLACED Y REPLACED \$2,454	25.0	
M7 M7 MR CUR	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING	NOT RECOM	MENDED - CO MENDED - CO \$98	DNTROLS RECENTL DNTROLS RECENTL \$2,231	Y REPLACED Y REPLACED		
M7 M7 M7 MR CUR M9 NFRARE	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398	NOT RECOM NOT RECOM 31.0	MENDED - CO MENDED - CO \$98	DNTROLS RECENTL DNTROLS RECENTL \$2,231	Y REPLACED Y REPLACED \$2,454	25.0	
M7 M7 M8 M9 M9 MFRARE M10 ENERGY	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS RTAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398 DB GREENHOUSE Y SAVING FLUORESCENT BUILDING #50	NOT RECOM NOT RECOM 31.0	MENDED - CO MENDED - CO \$98 \$2,050	DNTROLS RECENTL DNTROLS RECENTL \$2,231 \$39,272	Y REPLACED Y REPLACED \$2,454 \$43,199	25.0	0.8
M7 M7 M7 MR CUR M9 NFRARE	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS RTAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398 DB GREENHOUSE Y SAVING FLUORESCENT BUILDING #50 DATA PROCESSING	NOT RECOM NOT RECOM 31.0	MENDED - CO MENDED - CO \$98 \$2,050	DNTROLS RECENTL DNTROLS RECENTL \$2,231 \$39,272	Y REPLACED Y REPLACED \$2,454	25.0	0.8
M7 M7 M8 M9 MFRARE M10 ENERGY	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS BUILDING #398 DB GREENHOUSE Y SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52	NOT RECOM NOT RECOM 31.0 439.0	MENDED - CO MENDED - CO \$98 \$2,050	\$25,392	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931	25.0 21.1 89.0	0.8
M7 M7 M7 MR CUR M9 NFRARE M10	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS BUILDING #398 DB GREENHOUSE (SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA	NOT RECOM NOT RECOM 31.0	MENDED - CO MENDED - CO \$98 \$2,050	\$25,392	Y REPLACED Y REPLACED \$2,454 \$43,199	25.0	0.8
M7 M7 M8 M9 MFRARE M10 ENERGY E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398 DB GREENHOUSE Y SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56	NOT RECOM NOT RECOM 31.0 439.0 20.3	MENDED - CO MENDED - CO \$98 \$2,050 \$314 \$1,084	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931 \$97,429	25.0 21.1 89.0 89.9	0.8 0.1 0.1
M7 M7 M8 M9 MFRARE M10 ENERGY	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398 DB GREENHOUSE F SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL	NOT RECOM NOT RECOM 31.0 439.0	MENDED - CO MENDED - CO \$98 \$2,050 \$314 \$1,084	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931	25.0 21.1 89.0	0.8 0.1 0.1
M7 M7 M8 M9 NFRARE M10 ENERGY E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398 DB GREENHOUSE Y SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56	NOT RECOM NOT RECOM 31.0 439.0 20.3	MENDED - CO MENDED - CO \$98 \$2,050 \$314 \$1,084 \$732	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572 \$11,291	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931 \$97,429	25.0 21.1 89.0 89.9	0.8 0.1 0.1 0.6
M7 M7 M8 M9 NFRARE M10 ENERGY E1 E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS ED HEATING BUILDING #398 DB GREENHOUSE F SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #77	NOT RECOM NOT RECOM 31.0 439.0 20.3 49.5	MENDED - CO MENDED - CO \$98 \$2,050 \$314 \$1,084 \$732	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572 \$11,291	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931 \$97,429 \$12,420	25.0 21.1 89.0 89.9 17.0 66.4	0.8 0.1 0.1 0.6 0.1
M7 M7 M8 M9 NFRARE M10 ENERGY E1 E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS RTAINS BUILDING #470 DB VOC SHOPS BUILDING #398 DB GREENHOUSE (SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #77 MEDIA CENTER BUILDING #102 FINANCE	NOT RECOM NOT RECOM 31.0 439.0 20.3 49.5	MENDED - CO MENDED - CO \$98 \$2,050 \$314 \$1,084 \$732 \$968	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572 \$11,291 \$58,392	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931 \$97,429 \$12,420	25.0 21.1 89.0 89.9 17.0	0.8 0.1 0.1 0.6 0.1
M7 M7 M8 M9 NFRARE M10 E1 E1 E1 E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS RTAINS BUILDING #470 DB VOC SHOPS BUILDING #398 DB GREENHOUSE (SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136	NOT RECOM NOT RECOM 31.0 439.0 20.3 49.5 44.5 62.4 21.9	MENDED - CO MENDED - CO \$98 \$2,050 \$314 \$1,084 \$732 \$968 \$376	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572 \$11,291 \$58,392 \$9,836	\$2,454 \$2,454 \$43,199 \$27,931 \$97,429 \$12,420 \$64,231 \$10,820	25.0 21.1 89.0 89.9 17.0 66.4 28.8	0.8 0.1 0.1 0.6 0.1
M7 M7 M8 M9 NFRARE M10 ENERGY E1 E1 E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS RTAINS BUILDING #470 DB VOC SHOPS BUILDING #398 DB GREENHOUSE (SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS	NOT RECOM NOT RECOM 31.0 439.0 20.3 49.5 44.5 62.4	MENDED - CO MENDED - CO \$98 \$2,050 \$314 \$1,084 \$732 \$968 \$376	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572 \$11,291 \$58,392 \$9,836	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931 \$97,429 \$12,420 \$64,231	25.0 21.1 89.0 89.9 17.0 66.4	0.86 0.17 0.15 0.66 0.19
M7 M7 M8 M9 NFRARE M10 ENERGY E1 E1 E1 E1 E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS ETAINS BUILDING #470 DB VOC SHOPS BUILDING #398 DB GREENHOUSE (SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #77 MEDIA CENTER BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS BUILDING #345	NOT RECOM NOT RECOM 31.0 439.0 20.3 49.5 44.5 62.4 21.9 31.7	MENDED - CO \$98 \$2,050 \$314 \$1,084 \$732 \$968 \$376 \$690	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572 \$11,291 \$58,392 \$9,836 \$54,682	Y REPLACED Y REPLACED \$2,454 \$43,199 \$27,931 \$97,429 \$12,420 \$64,231 \$10,820 \$60,150	25.0 21.1 89.0 89.9 17.0 66.4 28.8 87.2	0.54 0.80 0.11 0.60 0.11 0.4
M7 M7 M7 AIR CUR M9 NFRARE M10 ENERGY E1 E1 E1 E1	BOILER PLANT DE HVAC CONTROLS BUILDING #470 DB VOC SHOPS BUILDING #1008 LPU BARRACKS RTAINS BUILDING #470 DB VOC SHOPS BUILDING #398 DB GREENHOUSE (SAVING FLUORESCENT BUILDING #50 DATA PROCESSING BUILDING #52 CACDA, CAORA BUILDING #56 POST CHAPEL BUILDING #102 FINANCE BUILDING #136 COMMUNICATIONS	NOT RECOM NOT RECOM 31.0 439.0 20.3 49.5 44.5 62.4 21.9	MENDED - CO \$98 \$2,050 \$314 \$1,084 \$732 \$968 \$376 \$690	\$2,231 \$2,231 \$39,272 \$25,392 \$88,572 \$11,291 \$58,392 \$9,836	\$2,454 \$2,454 \$43,199 \$27,931 \$97,429 \$12,420 \$64,231 \$10,820	25.0 21.1 89.0 89.9 17.0 66.4 28.8	0.86 0.17 0.15 0.66 0.19

n% SIOH Page-11

ALL ECOs REJECTED

ECO	BUILDING NAME	ENERGY SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	TOTAL PROJECT COST*	SIMPLE PAYBACK YEARS	SIR
INSULAT	TON						
A1	BUILDING #56 POST CHAPEL	740.0	\$3,383	\$85,681	\$94,249	27.9	0.62
A1	BUILDING #136 COMMUNICATIONS	6.0	\$19	\$3,403	\$3,743	197.0	0.11
A1	BUILDING #318 OFFICERS CLUB	245.0	\$895	\$16,846	\$18,531	20.7	0.92
A1	BUILDING #345 PATCH CENTER BUILDING #470	377.0	\$1,267	\$28,139	\$30,953	24.4	0,81
A1	DB VOC. SHOPS BUILDING #1008	157.5	\$514	\$18,779	\$20,657	40.2	0.50
A1	DB BARRACKS BUILDING #1009	131.0	\$487	\$16,359	\$17,995	37.0	0.51
A1	DB MESS HALL	81.0	\$294	\$9,775	\$10,753	36.6	0.52
THERMO	PANE GLASS			· · · · · · · · · · · · · · · · · · ·			
A 2	BUILDING #52 CACDA, CAORA	620.6	\$1,999	\$143,462	\$157.808	78.9	0.26
7.2	BUILDING #52	020.0	का,उठ्ड	\$145,402	ψ137,000	70.0	0.20
A2	CACDA, CAORA *A BUILDING #470	543.9	\$2,403	\$175,654	\$193,219	80.4	0.22
A2	DB VOC. SHOPS	327.7	\$1,041	\$53,116	\$58,428	56.1	0.36
WEATHE	RIZATION						
A 3	BUILDING #52 CACDA, CAORA	39.2	\$126	\$6,092	\$6,701	53.2	0.38
A3	BUILDING #136 COMMUNICATIONS	4.1	\$13	\$1,604	\$1,764	135.7	0.15
A3	BUILDING #429 M P QUARTERS	10.4	\$37	\$5,064	\$5,570	150.6	0.12
АЗ	BUILDING #470 DB VOC. SHOPS BUILDING #470	6.0	\$19	\$1,367	\$1,504	79.1	0.26
A3	DB VOC. SHOPS *A BUILDING #470	86.0	\$271	\$8,950	\$9,845	36.3	0.57
A3	DB VOC. SHOPS *B	74.0	\$233	\$29,355	\$32,291	138.6	0.15
A3	DB VOC. SHOPS *C	114.0	\$359	\$9,396	\$10,336	28.8	0.71
SOLAR	FILM BUILDING #52	[1		
A4		NOT RECOM	MENDED- EX	<u>ISTING WINDOWS IN</u>	N POOR CONE	NOITION	
A4	BUILDING #470 DB VOC. SHOPS	(\$27)	224	\$2,085	\$2,294	10.2	0.51
VESTIBL	II FS						
A5	BUILDING #1008 D B BARRACKS	VESTIBLII ES	EXISTING -S	EE A3 FOR NEW DO	OBS		
A5	AFH - VESTIBULES	1759.0				70.1	0.24
A5	AFH - NEW ENTRY DOOR				\$666,239	47.7	0.35
A5	AFH - NEW PATIO DOOR	3593.0				19.6	0.86
	GLASS AREA						
A6	BUILDING #52 CACDA, CAORA	67.9	\$298	\$13,987	\$15,386	51.6	0.34
A6	BUILDING #470 DB VOC. SHOPS	204.4				92.7	0.23
A6	BUILDING AFH AREAS 11-19 ONLY	3906.3		\$287,780		18.4	0.95
	INTERO TITIO ONE!	1 3900.3	1	9201,100	<u>ι</u> ψυ ι υ,υυο	10.7	0.00

^{*} TOTAL PROJECT COST IS CONSTRUCTION COST + 10% SIOH

ALL ECOs REJECTED

ECO	BUILDING NAME	SAVINGS MBTU'S/YR	ENERGY SAVINGS (\$)	CONSTRUCTION COST	PROJECT COST*	PAYBACK YEARS	SIR
LOADING	G DOCK SEALS						
A7	BUILDING #77 MEDIA CENTER	6.7	\$21	\$5,588	\$6,147	292.7	0.07
A 7	BUILDING #136 COMMUNICATIONS	8.7	\$26	\$1,645	\$1,810	69.6	0.30

						, , ,	
			ENERGY	ENERGY	PROJECT	SIMPLE	
	PROJECT GROUP	ECC	SAVINGS	SAVINGS	COST	PAYBACK	SIR
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		MBTU/YR	\$	\$	YRS	
	GROUP 1		WIE TO TIT	¥			
	Steam Trap Program			1			
	Steam Hap Flogram	İ					
0.70	Out to Tastina (san 400 Anana	E00.140	0.407.0	A7 774	#4.0E0/VD	0.6	140 41
SIP-B	Service Testing (per 100 traps	ECO-M8	2467.0		\$4,350/YR	0.6	142.41
	GROUP 1 TOTALS		2467.0	\$7,771	\$4,350/YR	0.6	142.41
L							
	GROUP 2						
	In House Low Cost No Cost						
470	Building 470	ECO-E3	10.7	\$265	\$238	0.9	12.14
	Building 470	ECO-M5	39.3	\$124	\$216	1.7	7.79
"	GROUP 2 TOTALS	200 1110	50.0		\$454	1.2	8.83
	5.155. 2.1517.25		50.0	\$ 555	4.5 ,		
	GROUP 3						
	Upgrade HVAC						
į							
	Building 48	ECO-M7	290.0	4 .,	\$9,765	2.2	4.10
52	Building 52	ECO-M7	3724.0	\$36,638	\$26,265	0.7	13.64
56	Building 56	ECO-M1	58.0	\$903	\$5,601	6.2	1.47
56	Building 56	ECO-M7	920.0	\$4,068	\$12,169	3.0	4.00
102	Building 102	ECO-M7	863.0		\$10,203	2.1	5.21
136	Building 136	ECO-M7	3914.0	I	\$30,451	1.3	8.40
	Building 345	ECO-M7	448.0		\$10,304	4.4	2.58
	Building 429	ECO-M7	413.0	1	\$8,528	3.9	2.92
	Building 1009	ECO-M7	253.0	1	\$684	0.6	19.74
'''	GROUP 3 TOTALS	200 1117	10883.0		\$113,970	1.4	7.27
				4,0,0	*		
	GROUP 4			1		ľ	
1	1			1			
	Replace Incandescent						
50	Building 50	ECO-E3	7.3	\$113	\$202	1.8	6.57
	Building 52	ECO-E3	2.7	\$87	\$591	6.8	1.57
	Building 77	ECO-E3	26.5	\$411	\$1,082	2.6	4.46
	Building 102	ECO-E3	1.0	1	\$72	1.1	4.65
	Building 136	ECO-E3	12.9	1 '	\$486	1.8	6.15
	Building 345	ECO-E3	4.2	1	\$384	2.7	3.91
1	GROUP 4 TOTALS		54.6		\$2,817	2.6	
}		1	I 5 [¬] .0	1 .,000	l,		

			2000				
		500	ENERGY	ENERGY	PROJECT	SIMPLE	010
	PROJECT GROUP	ECCO	SAVINGS MBTU/YR	SAVINGS \$	COST \$	PAYBACK YRS	SIR
	GROUP 5		WID TO/TIX	Ψ	Ψ		
	Insulate Steam Lines						
102	Building 102	ECO-M5	216.3	\$682	\$1,015	1.5	9.10
	Building 1009	ECO-M5	78.5	· ·	\$432	1.7	7.77
USDB	USDB Overall	ECO-M5	1479.0	\$4,658	\$10,486	2.3	6.02
	GROUP 5 TOTALS		1773.8	\$5,588	\$11,933	2.1	6.35
	GROUP 6		1	· · · · · · · · · · · · · · · · · · ·			
	Reduce Infiltration						
25	Building 25	ECO -A3	224.0	\$1,090	\$5,294	4.9	3.43
25	Building 25	ECO -A5	167.0	1	\$6,379	12.2	4.76
	Building 77	ECO -A3	39.0	\$517	\$5,811	11.2	1.08
	Building 345	ECO -A3	. 18.0		\$314	4.8	3.96
	Building 345	ECO -A6	60.0	1 '	\$1,004	4.9	4.04
	Building 1008	ECO -A3	130.0	1	\$4,253	6.8	2.45
1009	Building 1009	ECO -A5	146.0		\$6,832	10.0	
	GROUP 6 TOTALS		784.0	\$3,708	\$29,887	8.1	2.09
	GROUP 7						
	Replace Motors						
	Building 25	ECO-E4	150.1	\$2,327	\$14,793	7.0	1.68
	Building 345	ECO-E4	18.9	1	\$2,680	9.1	1.28
	Building 470	ECO-E4	26.7	N .	\$3,469	8.4	1.40
USDB	USDB Overall	ECO-E4	136.0		\$18,206	8.6	1.36
	GROUP 7 TOTALS		331.7	\$5,142	\$39,148	7.6	1.54
	GROUP 8						
	Building 225						
	Building 225	ECO-A4	160.0	1 ' '	\$18,784	4.8	1
225	Building 225	ECO-M3	346.0	7	\$11,230	10.3	1.32
	GROUP 8 TOTALS		506.0	\$5,017	\$30,014	6.0	2.18

	PROJECT GROUP	ECC	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 9 Building 56						
	Building 56	ECO-A2	243.0		\$17,615	13.2	1.20
56	Building 56	ECO-A3	123.0	\$893	\$5,455	6.1	2.34
56	Building 56	ECO-A4	30.0	\$637	\$5,286	8.3	1.34
56	Building 56	ECO-A6	64.0	\$767	\$7,884	10.3	1.21
56	Building 56	ECO-E3	88.0	\$2,112	\$18,594	8.8	1.24
	GROUP 9 TOTALS		548.0		\$54,834	9.5	1.34

ENERGY AND COST SAVINGS

TOTAL POTENTIAL ENERGY AND COST SAVINGS

		г	
		ENERGY	ENERGY
		SAVINGS	SAVINGS
		MBTU/YR	\$/YR
GROUP 1	STEAM TRAP PROGRAM	2,467	\$7,771
GROUP 2	IN HOUSE LOW COST/NO COST	50	\$389
GROUP 3	UPGRADE HVAC	10,883	\$79,810
GROUP 4	REPLACE INCANDESCENT	55	\$1,089
GROUP 5	INSULATE STEAM LINES	1,774	\$5,588
GROUP 6	REDUCE INFILTRATION	784	\$3,708
GROUP 7	REPLACE MOTORS	332	\$5,142
GROUP 8	BUILDING 225	506	\$5,017
GROUP 9	BUILDING 56	548	\$5,744
	TOTAL	17,398	\$114,258

PERCENTAGE OF ENERGY CONSERVED

POTENTIAL ENERGY SAVINGS, MBTU	17,398
EXISTING ENERGY CONSUMPTION, MBTU	83,929
PERCENT ENERGY CONSERVED	20.7%

ENERGY USE AND COST

	ENERGY	ENERGY
	MBTU/YR	\$/YR
BEFORE ECO IMPLEMENTATION	83,929	\$841,937
AFTER ECO IMPLEMENTATION	66,531	\$727,679

	PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 1 Steam Trap Program						
STP-B	Service Testing (per 100 traps	ECO-M8	2467.0	\$7,771	\$4,350/YR	0.6	142.41
	GROUP 1 TOTALS		2467.0	\$7,771	\$4,350/YR	0.6	142.41

ENERGY SAVINGS CALCULATION SHEET		FEB	. 4,	198					T 1	0F 1
OJEC FORT LEAVENWORTH						CULA	ATIO	N		
ENERGY SAVINGS OPPORTUNITY SURVEY						_				
CATION	-		<u> </u>						IONS	10110
OLUTEOT ENOINEED									ULAT	IONS
CHITECT/ENGINEER	-					TRAC HER				
CLARK RICHARDSON & BISKUP O MEASURE		CON	APLI	TEC		HEN			KED E	RV.
STEAM TRAP PROGRAM - SERVICE TEST			,,, C		MAW		۱۲,	0	INCO E	DEC
COST OF STEAM AT FORT LEAVENWORTH		, , , ,					···········			
	148									
•	,187	BTU	I/LBI	M						
SYSTEM EFFICIENCY = 6	60%									
NATURAL GAS COST = \$3	3.15	NACE	-							
HEAT CONTENT OF NAT. GAS = 1,000,				`E						
HEAT CONTENT OF NAT. GAS = 1,000,	,000	510	// IVIC	/ 1						
((1,187-148)*\$3.15)/0.6*1,000) \$5	5.45	PER	≀тн	OU:	SAN	D LB	STE	АМ		
((1,100,100,100,100,100,100,100,100,100,										
COST OF INSPECTING TRAPS USING AND OUTSIDE: ASSUMING AN AVERAGE OF 50 TRAPS PER DAY, 8 H OF \$20 PER TRAP PLUS THE HOURLY CHARGE. CONTRACT TESTING = 8 MH : \$40 PER HOUR = \$320 50 TRAPS PER DAY =	HOUF =		ER (\$2 \$32	DAY 20 20	/. TH PER PER	IE CO TRAI DAY TRAI	P	IS A	FLAT	- FEE
	_									_
TOTAL COST PER TRAP =	:		\$2 	26 	PER	TRAI	P			
SAVINGS FROM TRAP INSPECTION										
USING 100 TRAPS AS A BASE WITH A 10% FAILURE R	RATE	; 350) LB	/HR	F&T	TRA	P			
COST OF INSPECTING TRAPS ONCE			1	00	X	\$26		_ 9	\$2 600	/ YEAF
DURING THE HEATING SEASON			•	00	^	Ψ0			#— , 00 0	7 1 2 7 11
NUMBER OF TRAPS FAILED			1	00	Х	10%	%		= 10	TRAPS
							_		.	
COST OF REPAIRING TRAPS				10	Х	\$12	25	= ;	\$1,250	
TOTAL COST FOR TESTING AND REPAIRING TRAPS								_ (\$3,850	,
							 ,			
		1	423	350	LBS	OF S	TM/	YEA	AR /TR	AP
65lbs/hr X 4380 hrs/yr X 0.5(sys. modulation factor) =		•	72,0							
	=	•	-			U/ YE	AR	/TR/	٩P	
W 6 1 W (4407 440) (4 000 000		•	-			U/ YE	EAR	/TR/	٩P	
			1	148	MBT	U/ YE				
#of steam X (1187-148) /1,000,000 = @\$5.45/1000 # steam	=		1 \$7	148 76	MBT / YE/	AR PI	ER T	RAF	o	.
#of steam X (1187-148) /1,000,000 =	=		1 \$7	148 76	MBT / YE/	AR PI	ER T	RAF		R
#of steam X (1187-148) /1,000,000 = @\$5.45/1000 # steam	= : 10	x	1 \$7	148 76 18	MBT / YE <i>i</i> =	AR PI	ERT	TRAF	o J/ YEA	R

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

STUDY: FTLVGRUP LCCID 1.001

INSTALLATION & LOCATION: FT LEAVENWORTH

REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

FISCAL YEAR 1987

DISCRETE PORTION NAME: GROUP 1

PREPARED BY: CRB ANALYSIS DATE: 06-2-89 ECONOMIC LIFE 15 YEARS

1.	INVESTMENT		
	A. CONSTRUCTION COST	\$	0.
	B. SIOH	\$	500.
	C. DESIGN COST	\$	0.
	D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	450.
	E. SALVAGE VALUE COST `	-\$	0.
	F. TOTAL INVESTMENT (1D-1E)	\$	450.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL		JNIT COST G/MBTU(1)	SAVINGS MBTU/YR(2)		INUAL \$.VINGS(3)	DISCOUNT FACTOR(4)	OUNTED NGS(5)
A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$	15.50 .00 .00 3.15 .00	0. 0. 0. 2467. 0.	\$ \$ \$ \$ \$	0. 0. 0. 7771. 0.	8.59 11.28 12.01 12.76 10.17	0. 0. 0. 99159. 0.
F. TOTAL			2467.	\$	7771.		\$ 99159.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		\$ -3850.
(1) DISCOUNT FACTOR (TABLE A)	9.11	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		\$ -35074.

B. NON RECURRING SAVINGS (+) / COSTS (-)

	SAVINGS (+)	YR	DISCNT	DISCOUNTED
ITEM	COST (-)	OC	FACTR	SAVINGS (+)/
	(1)	(2)	(3)	COST (-) (4)

*. TOTAL

0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$	-35074.
of the field bloodering of the officers	Ψ	0007

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$	32722.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=		
C IF 3D1B IS = > 1 GO TO ITEM 4	_	

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

4.	FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))	\$ 3921.

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY)

(SIR)=(5/1F)= 142.41

64085.

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ste fun eff	DESCRIPTION AND JUSTIFICATION OF WORK TO BE ACCOMPLISHED Laking steam traps are significant source of energy loss. A properly functioning steam trap passes only a small amount of steam through it. If the traps are not functioning properly, steam passes through or escapes from the trap, reducing the efficiency and capacity of the steam system. The boiler operates at a higher capacity than necessary and more make-up water is required to replace the lost steam. REQUESTER INFORMATION REQUESTER INFORMATION TELEPHONE NO. SIGNATURE																					
											FORW	ARD	ΕO	R APP	ROVA		***					
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DA 1 AUG 78 4283 EDITION OF 1 FEB 78 WILL BE USED UNTIL EXHAUSTED.

WHITE PINK



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WHITE (ORIGINAL) -- PROJECT FILE COPY
PINK -- FORWARD TO KEYPUNCH AFTER COMPLETION
OF "APPROVAL ACTION" BLOCK

GREEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK



	PROJECT GROUP	ECCO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 2 In House Low Cost No Cost						
	Building 470	ECO-E3	10.7	\$265	\$238	0.9	12.14
470	Building 470	ECO-M5	39.3	\$124	\$216	1.7	7.79
	GROUP 2 TOTALS		50.0	\$389	\$454	1.2	8.83

ENERGY S	AVINGS CALCUL	ATION SHEET	DATE P 2/87	REPARED	SHEET 1	0F 1
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ESOS						
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MEASURE			COMPU		CHECKE	D BY
BLDG. #47	E-3 REPLACE	INCANDESCENT SA	VINGS	DLH		
ENERGY S	AVINGS					
				4 740	00	
EXISTING BU	ILDING HEATING E	NERGY USAGE (MBTU P	ER YR.)	1,740. 1,748.		
MODIFIED BO	ALDING REATING E	NERGY USAGE (MBTU F		1,770,		
EXISTING BU	ILDING COOLING E	NERGY USAGE (KWH PE	ER YR.)	233,6		
MODIFIED BL	JILDING COOLING B	ENERGY USAGE (KWH P	ER YR.)	228,1	23	
MBTU'S SAV	ED PER YR	10.70 MBTU				
MIDIOOON						
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COOLING ME	BTU SAVED PER YE	EAR X AVERAGE DOLL		U = DOLLARS \$29	S SAVED PEI	R YEAR
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ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED SHEET OF 2/87 1 1
PROJECT ESOS	BASIS FOR CALCULATION
LOCATION FORT LEAVENWORTH	HAND CALCULATIONS X COMPUTER CALCULATIONS
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP	CONTRACTOR BID OTHER (SPECIFY) BIN METHOD
ECO MEASURE BLDG. #470 E-3 LIGHTING FIXTURE SUMMARY	COMPUTED BY CHECKED BY DLH

SUMMARY OF INCANDESCENT LIGHTING FIXTURES:

QUANTITY	FIXTURE TYPE & DESCRIPTION
19	[G] -SUSPENDED FIXTURE W/ 1-75W BARE INCANDESCENT LAMP
1	[i] - SUSPENDED FIXTURE W/ 1-120W BARE INCANDESCENT LAMP
	REPLACE EXISTING 300 WATT LAMPS IN MECHANICAL ROOMS, RESTROOMS, EQUIPMENT ROOMS AND STORAGE ROOMS WITH ABOVE LAMPS.

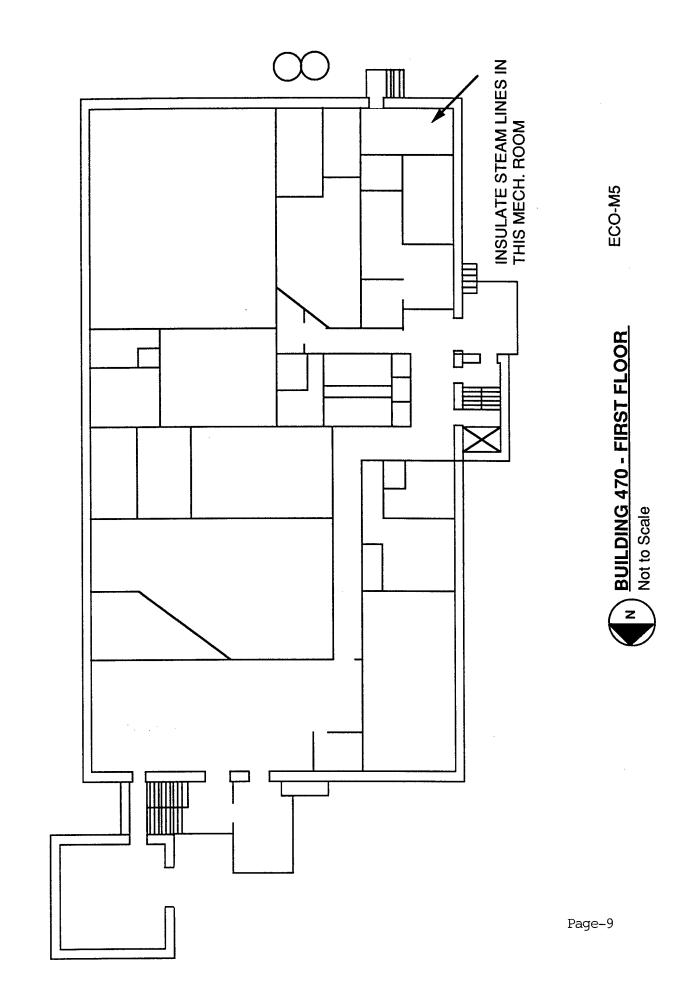
ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF				
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PROJECT FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCULAT	ION				
LOCATION	X HAND CALCULATIONS COMPUTER CALCULATIONS					
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP	CONTRAC OTHER	CTOR BID (SPECIFY)				
ECO MEASURE INSULATE STEAM LINES	COMPUTED BY MAW	CHECKED BY DEC				

BUILDING NO. 470

ALL STEAM LINES ARE INSULATED EXECPT SOME LINES IN THE MECH. ROOM.

1	5	P	SI	S	TE	ΑI	VI

PIPE SIZE	FEET OF UNINSULTED PIPE	1000 BTU PER YEAR SAVED	\$ SAVED PER YEAR	COST OF INSUL. \$	
2"	25	27,482	\$124	\$196	
	RI III DING TOTA	M = 27.482	\$12 <i>A</i>	\$106	



LIFE CYCLE COST ANALYSIS SUMMARY **ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)**

STUDY: FTLVGRUP LCCID 1.001

INSTALLATION & LOCATION: FT LEAVENWORTH

REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

ГП	PROJECT NO. & TITLE. DAGA41-80-0-0081 FT LEAVENWORTH LOOS											
	SCAL YEAR 198 IALYSIS DATE:			CRETE PORTIO ECONOMIC LI			2 PREPARED I	BY: CR	В			
1.	INVESTMENT A. CONSTRU B. SIOH C. DESIGN CO D. ENERGY CO E. SALVAGE F. TOTAL INV	CTIO OST CRED VALU	IT CALC (1/ IE COST	•				\$ \$ \$ \$ \$ - \$	413. 41. 21. 427. ' 0. 427.			
2.	ENERGY SAV ANALYSIS DA			(-) INGS, UNIT CO	ST & [DISCOUNTED	SAVINGS					
	FUEL		NIT COST /MBTU(1)	SAVINGS MBTU/YR(2)		NNUAL \$ AVINGS(3)	DISCOUNT FACTOR(4)		SCOUNTED VINGS(5)			
	A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$	15.50 .00 .00 3.15 .00	19. 0. 0. 31. 0.	\$ \$ \$ \$ \$	295. 0. 0. 98. 0.	8.59 11.28 12.01 12.76 10.17		2530. 0. 0. 1246. 0.			
	F. TOTAL			50.	\$	392.		\$	3776.			
3.	NON ENERGY	/ SAV	'INGS(+) / C	OST(-)								
	A. ANNUAL F		\$	0.								
	(2) DISCO		\$	0.								
	C. TOTAL NO	3A2+3BD4)	\$	0.								

D.	PROJECT NON ENERGY QUALIFICATION TEST
	(1) 25% MAX NON ENERGY CALC (2F5 X .33)
	A JEODA IO OD OO TO JEEN A

1246.

8.83

A IF 3D1 IS = OR > 3C GO TO ITEM 4

B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=

C IF 3D1B IS = > 1 GO TO ITEM 4

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

392. 4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))

3776. 5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

6. DISCOUNTED SAVINGS RATIO (SIR)=(5/1F)=(IF < 1 PROJECT DOES NOT QUALIFY)

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WHITE (OF PINK



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icape lines re bus	lamaged or hazard cient					rasted and the pipes will continue to High wattage incandescent lights ar use of energy dollars. This ECO would 50 million BTU's per year.						re a very inef				
	****					PER	SON TO C	ALL FOR ADDITIO	NAI	INF	ORMATION					
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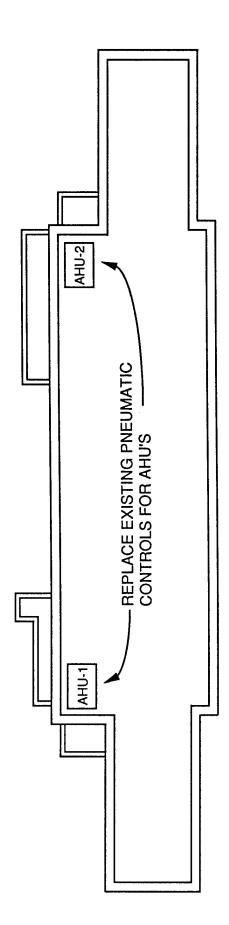
WHITE (ORIGINAL) = PROJECT FILE COPY
PINK = FORWARD TO KEYPUNCH AFTER COMPLETION
OF "APPROVAL ACTION" BLOCK

- FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

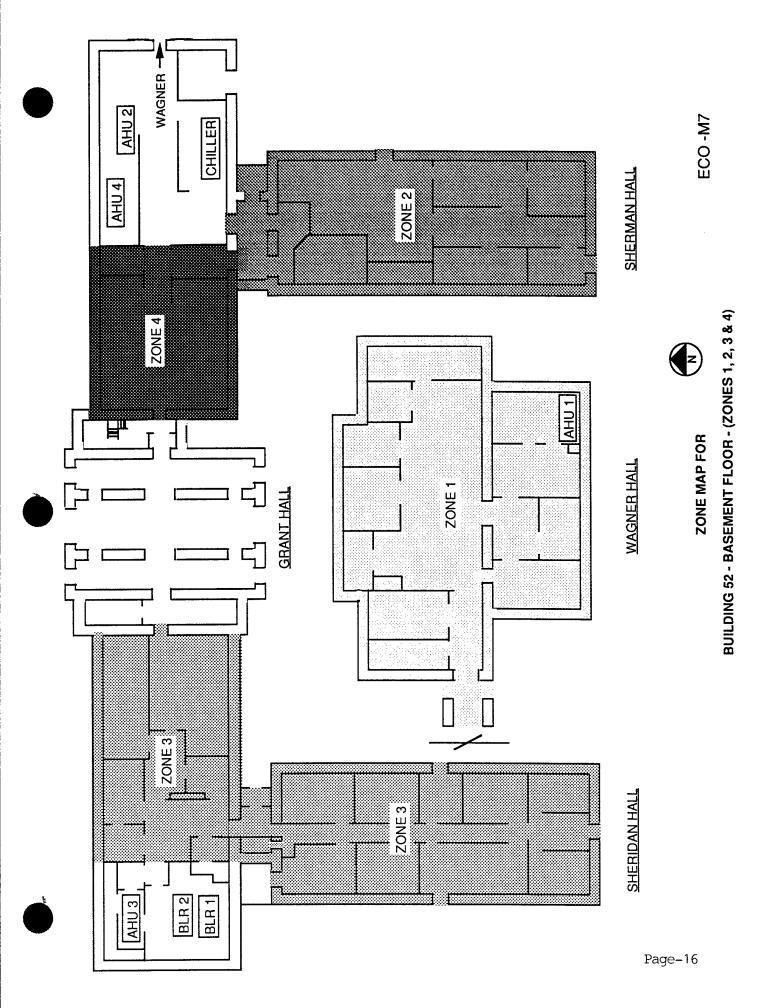


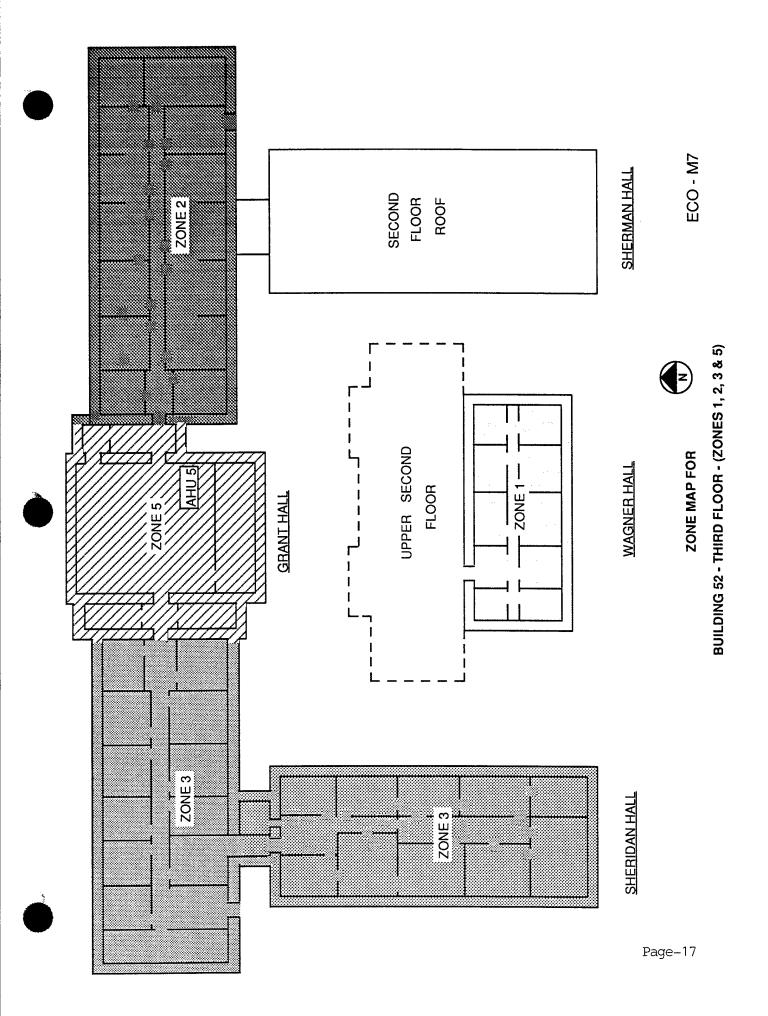
	PROJECT GROUP	ECCO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 3 Upgrade HVAC						
48	Building 48	ECO-M7	290.0	\$4,364	\$9,765	2.2	4.10
52	Building 52	ECO-M7	3724.0	\$36,638	\$26,265	0.7	13.64
56	Building 56	ECO-M1	58.0	\$903	\$5,601	6.2	1.47
56	Building 56	ECO-M7	920.0	\$4,068	\$12,169	3.0	4.00
102	Building 102	ECO-M7	863.0	\$4,753	\$10,203	2.1	5.21
136	Building 136	ECO-M7	3914.0	\$23,404	\$30,451	1.3	8.40
	Building 345	ECO-M7	448.0	\$2,343	\$10,304	4.4	2.58
	Building 429	ECO-M7	413.0	\$2,204	\$8,528	3.9	2.92
1009	Building 1009	ECO-M7	253.0	\$1,133	\$684	0.6	19.74
	GROUP 3 TOTALS		10883.0	\$79,810	\$113,970	1.4	7.27

	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 6/1/87	SHEET OF
ROJECT		BASIS FOR CALCULA	
CATIO	ESOS	HAND CAL	CULATIONS
	FORT LEAVENWORTH	COMPUTE	R CALCULATIONS
RCHITE	CT/ENGINEER CLARK RICHARDSON & BISKUP	X OTHER	TOR BID (SPECIFY) BIN METHO
O MEA	SURE	COMPUTED BY	CHECKED BY
_DG. #4	8 M7 UPGRADE HVAC CONTROLS	DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU F MODIFIED BUILDING HEATING ENERGY USAGE (MBTU I		
	EXISTING BUILDING COOLING ENERGY USAGE (KWH P MODIFIED BUILDING COOLING ENERGY USAGE (KWH P	ER YR.) 327,946. PER YR.) 246,114.	
	MBTU'S SAVED PER YR. 290.29 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLA		
	11.00 X \$3.15	= \$5	35
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLA		
	279.29 X \$15.50	= \$4,32	29
	ENERGY SAVINGS PER YEAR \$4,364		

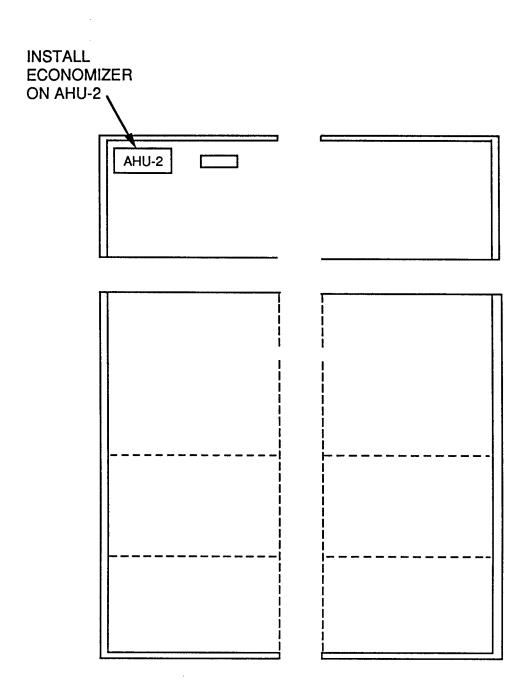


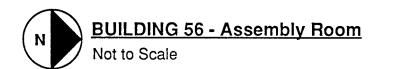
	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 6/1/87	SHEET OF
ROJECT		BASIS FOR CALCULAT	ION
OCATION	ESOS	HAND CALC	CUI ATIONS
.OOATION	FORT LEAVENWORTH	COMPUTER	R CALCULATIONS
RCHITEC	T/ENGINEER	CONTRACT	
CO MEAS	CLARK RICHARDSON & BISKUP	X OTHER (S	SPECIFY) BIN METHOD CHECKED BY
	M7 UPGRADE HVAC CONTROLS	DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PE MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PE		
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PE MODIFIED BUILDING COOLING ENERGY USAGE (KWH PE	R YR.) 1,430,708 R YR.) 839,769	
	MBTU'S SAVED PER YR. 3,723.87 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLAR	S PER MBTU = DOLLAR	S SAVED PER YEAR
	1,707.00 X \$3.15	= \$5,3	
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLAR		
	2,016.87 X \$15.50	= \$31,2	201
	ENERGY SAVINGS PER YEAR \$36,638		
	ENERGY SAVINGS FER TEAR \$30,030]		
	į		





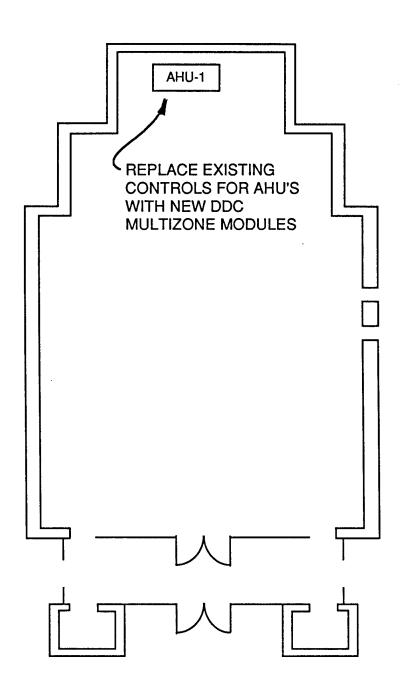
ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
`	6/1/87	1 1
PROJECT	BASIS FOR CALCULAT	TON
LOCATION	HAND CALC	CHI ATIONE
FORT LEAVENWORTH		R CALCULATIONS
ARCHITECT/ENGINEER	CONTRACT	
CLARK RICHARDSON & BISKUP	X OTHER (S	SPECIFY) BIN METHOD
ECO MEASURE	COMPUTED BY	CHECKED BY
BLDG. #56 M1 DRY BULB ECONOMIZER	MAW	
ENERGY SAVINGS		
EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YR	A.) 417,025.0 399,948.0	00 00
MBTU'S SAVED PER YR. 58.28 MBTU		
WIDTO O OAVED TERTIFIC		
COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS F		
58.28 X \$15.50	= \$903	3
ENERGY SAVINGS PER YEAR \$903		
•		

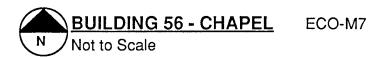


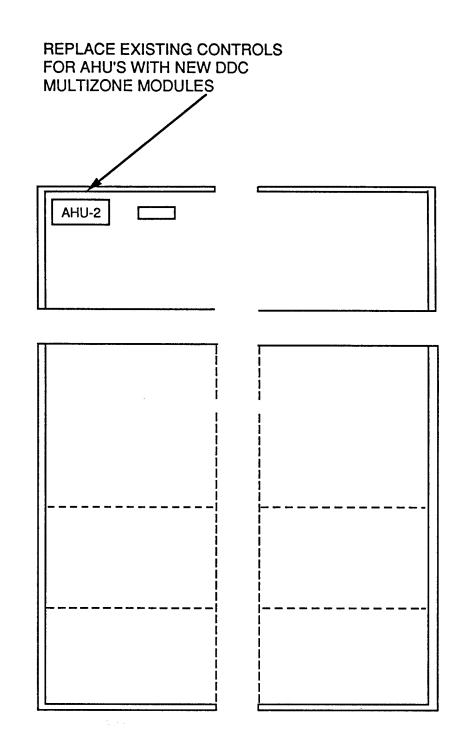


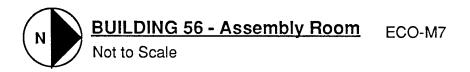
ECO-M1

	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 6/1/87	SHEET OF 1 1
PROJECT	ESOS	BASIS FOR CALCULATION	Ň
LOCATION		HAND CALCUL COMPUTER C	
ARCHITEC	T/ENGINEER	CONTRACTOR	BID
ECO MEAS	CLARK RICHARDSON & BISKUP	X OTHER (SPE	CIFY) BIN METHOD CHECKED BY
	M7 UPGRADE HVAC CONTROLS	DLH	OTILORED BY
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER	3,992.00 R YR.) 3,167.00	
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER	YR.) 444,791.00 417,025.00	
	MBTU'S SAVED PER YR. 919.77 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS 825.00 X \$3.15	PER MBTU = DOLLARS S = \$2,599	SAVED PER YEAR
	, ,	,	
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS 94.77 X \$15.50	PER MBTU = DOLLARS \$ 1,469	
	ENERGY SAVINGS PER YEAR \$4,068		
	•		

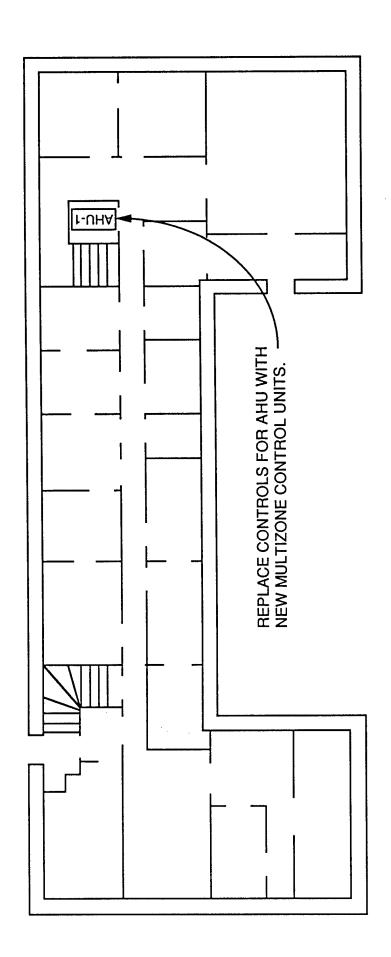








ENERGY SAVINGS CALCULATION SHEET		DATE PREPARED 6/1/87	SHEET OF
PROJECT ESOS		BASIS FOR CALCULA	ATION
LOCATION			LCULATIONS
FORT LEAVENWORTH ARCHITECT/ENGINEER		CONTRAC	ER CALCULATIONS STOR BID
CLARK RICHARDSON & BISKUP		X OTHER	(SPECIFY) BIN METHOD
ECO MEASURE BLDG. #102 M7 UPGRADE HVAC CONTROLS		COMPUTED BY DLH	CHECKED BY
ENERGY SAVINGS			
EXISTING BUILDING HEATING ENERGY US MODIFIED BUILDING HEATING ENERGY US			48.00 50.00
EXISTING BUILDING COOLING ENERGY US. MODIFIED BUILDING COOLING ENERGY US	AGE (KWH PER '	YR.) 184,35 YR.) 136,08	
MBTU'S SAVED PER YR. <u>862.77</u> MBTL	ı		
HEATING MBTU SAVED PER YEAR X AVEF	RAGE DOLLARS I 3.15		RS SAVED PER YEAR ,199
		,	,,,,,
COOLING MBTU SAVED PER YEAR X AVEI	RAGE DOLLARS 5.50		ARS SAVED PER YEAR ,,554
ENERGY SAVINGS PER YEAR \$4	,753		
• .			

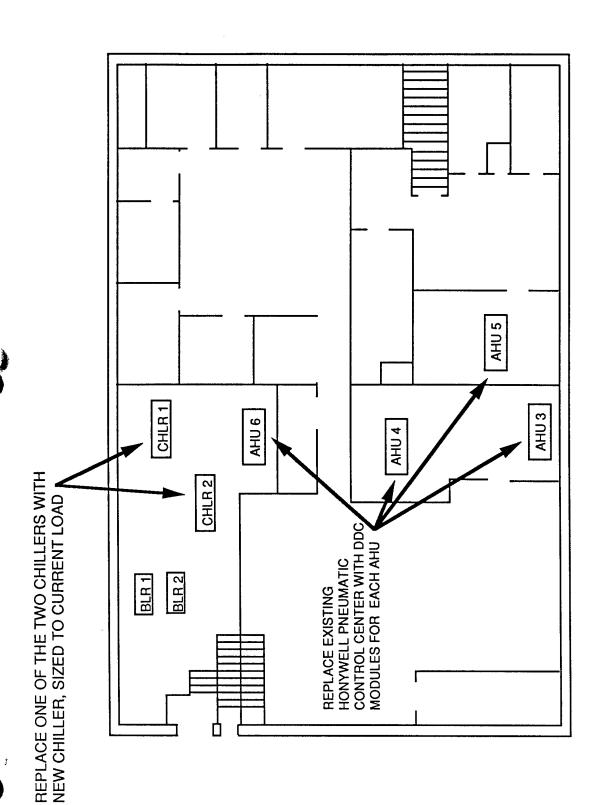


N BUILDING 102 - FIRST FLOOR ECO-M7
Not to Scale

N Not to Scale

ECO-M7

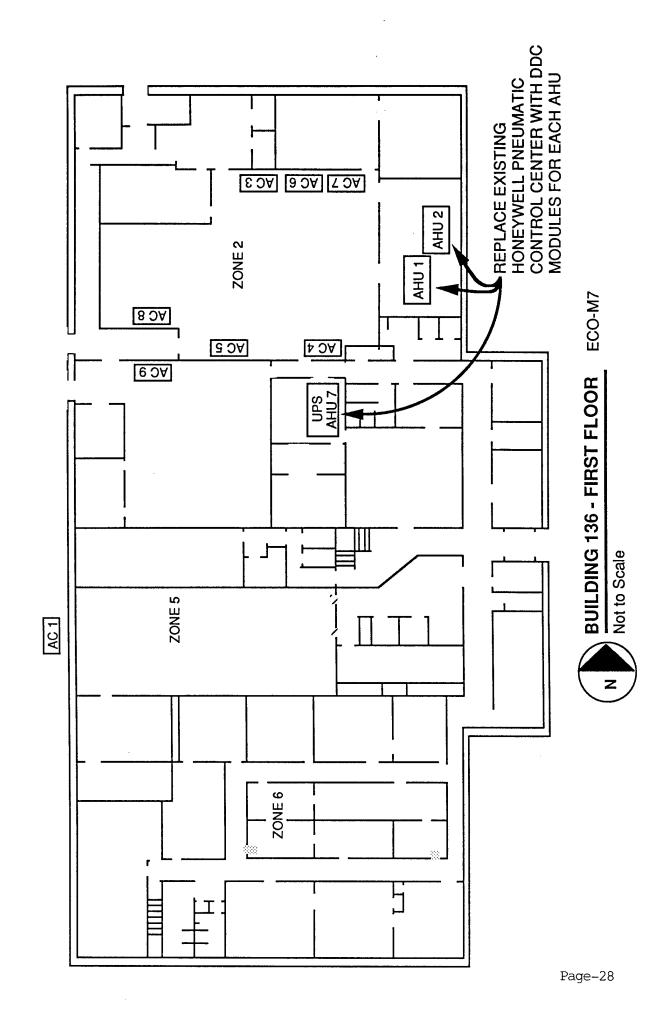
	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 6/1/87	SHEET OF
ROJECT	ESOS	BASIS FOR CALCULAT	rion
CATION		HAND CAL	CULATIONS
DOLUTE	FORT LEAVENWORTH CT/ENGINEER		R CALCULATIONS
HCHITEC	CLARK RICHARDSON & BISKUP	X OTHER (IOR BID SPECIFY) BIN METHOD
CO MEAS	SURE	COMPUTED BY	CHECKED BY
LDG. #13	66 M7 UPGRADE HVAC CONTROLS	DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PE MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PE		
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PERMODIFIED BUILDING COOLING ENERGY USAGE (KWH PE	R YR.) <u>5,442,469</u> R YR.) <u>5,179,720</u>	0.00 0.00
	MBTU'S SAVED PER YR. 3,913.76 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS	S PER MBTU - DOLLAR	S SAVED PER YEAR
	3,017.00 X \$3.15	= \$9,5	504
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLAR	S PER MBTU = DOLLAF	S SAVED PER YEAR
	896.76 X \$15.50	= \$13,9	
	ENERGY SAVINGS PER YEAR \$23,404		
*.			



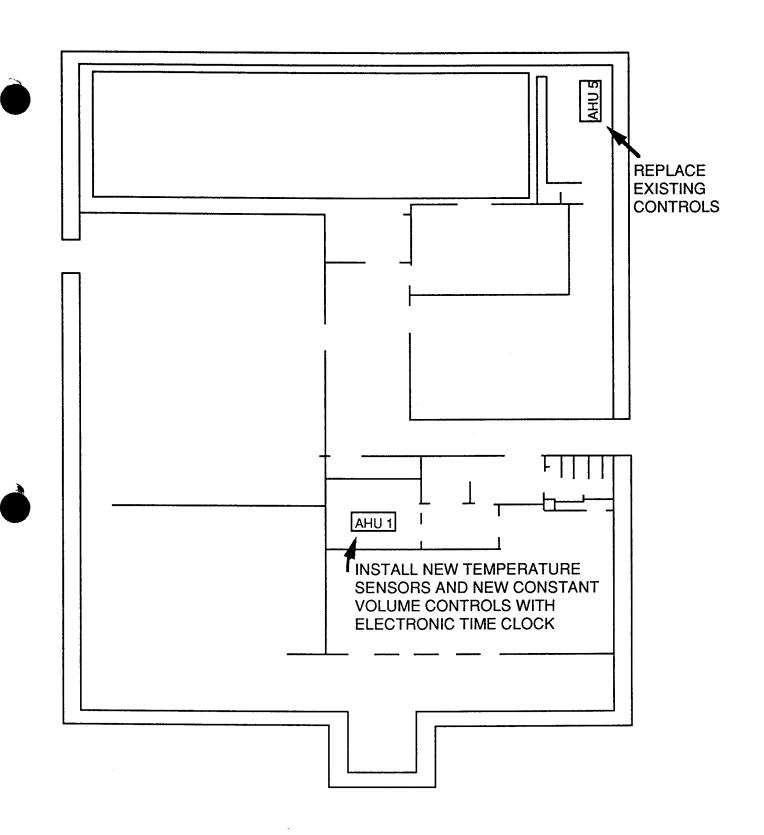
BUILDING 136 - BASEMENT FLOOR

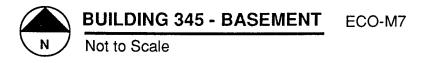
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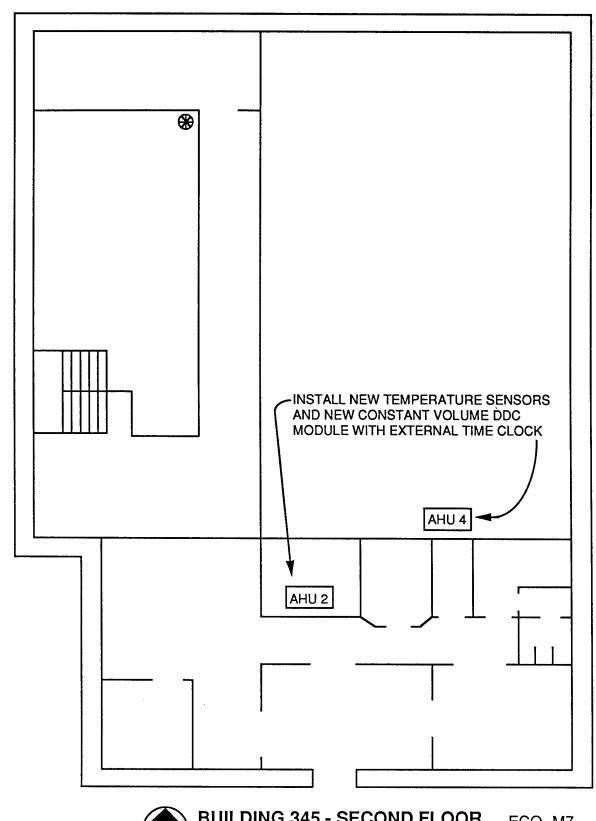
Page-27



	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 6/1/87	SHEET OF
ROJECT	ESOS	BASIS FOR CALCULA	TION
CATION	FORT LEAVENWORTH	COMPUTE	CULATIONS R CALCULATIONS
	CT/ENGINEER CLARK RICHARDSON & BISKUP	X OTHER	(SPECIFY) BIN METHO
O MEA .DG. #34	SURE 45 M7 UPGRADE HVAC CONTROLS	COMPUTED BY DLH	CHECKED BY
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (ME MODIFIED BUILDING HEATING ENERGY USAGE (M		
	EXISTING BUILDING COOLING ENERGY USAGE (K) MODIFIED BUILDING COOLING ENERGY USAGE (K	WH PER YR.) 138,42 WH PER YR.) 116,34	
	MBTU'S SAVED PER YR. 448.38 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DO	OLLARS PER MBTU = DOLLAF	RS SAVED PER YEAR
	373.00 X \$3.15		175
	·		
	COOLING MBTU SAVED PER YEAR X AVERAGE D		
	75.38 X \$15.50	= \$1,	168
	ENERGY SAVINGS PER YEAR \$2,343		
*			

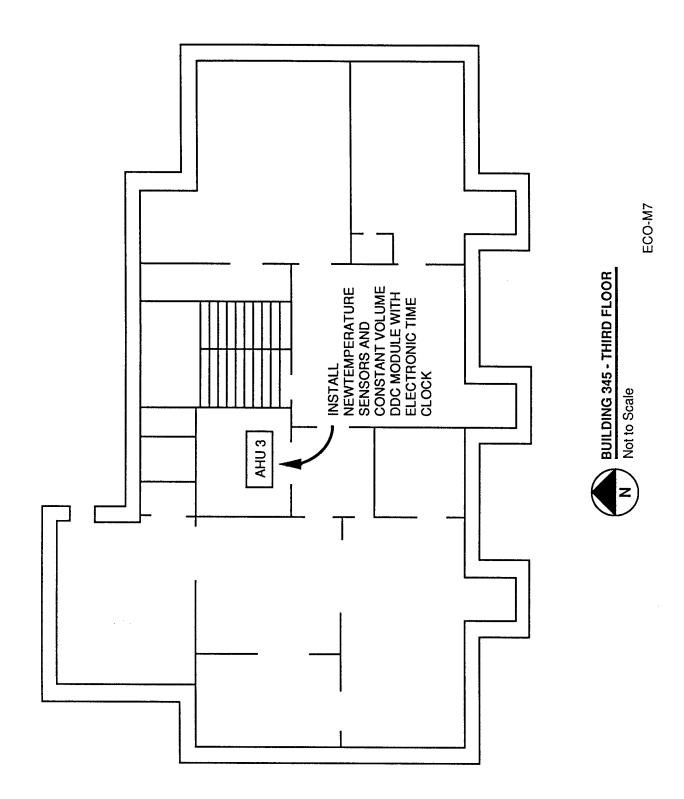




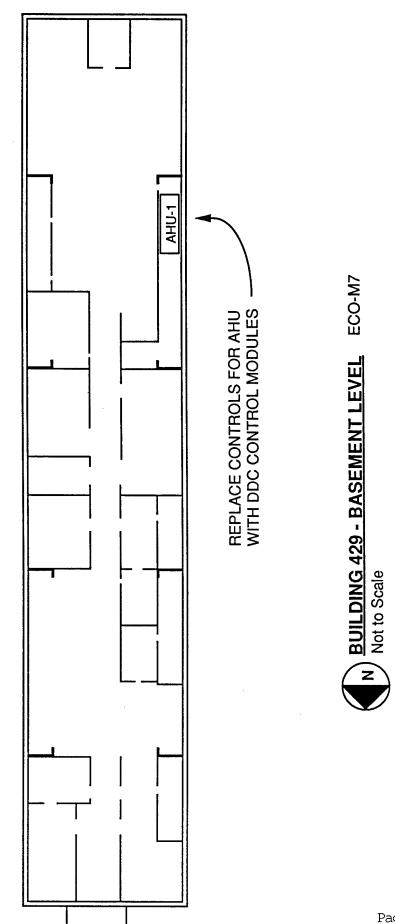


BUILDING 345 - SECOND FLOOR
Not to Scale

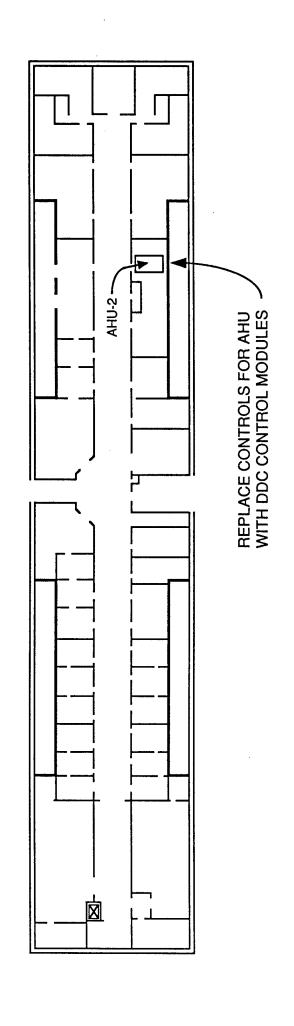
ECO -M7



	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 6/1/87	SHEET OF
ROJECT		BASIS FOR CALCULAT	
OCATION	ESOS	HAND CALC	ULATIONS
	FORT LEAVENWORTH	COMPUTER	CALCULATIONS
	T/ENGINEER CLARK RICHARDSON & BISKUP	CONTRACT X OTHER (S	OR BID SPECIFY) BIN METHO
CO MEAS	SURE	COMPUTED BY	CHECKED BY
LDG. #42	9 M7 UPGRADE HVAC CONTROLS	<u> </u> DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PERMODIFIED BUILDING HEATING ENERGY USAGE (MBTU PE		
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER	R YR.) 330,100 R YR.) 308,680	
	MBTU'S SAVED PER YR. 413.11 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS	S PER MBTU = DOLLARS	S SAVED PER YEAR
	340.00 X \$3.15	= \$1,0	71
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS	S PER MBTU = DOLLAR	S SAVED PER YEAR
	73.11 X \$15.50	= \$1,1	
	ENERGY SAVINGS PER YEAR \$2,204		
			



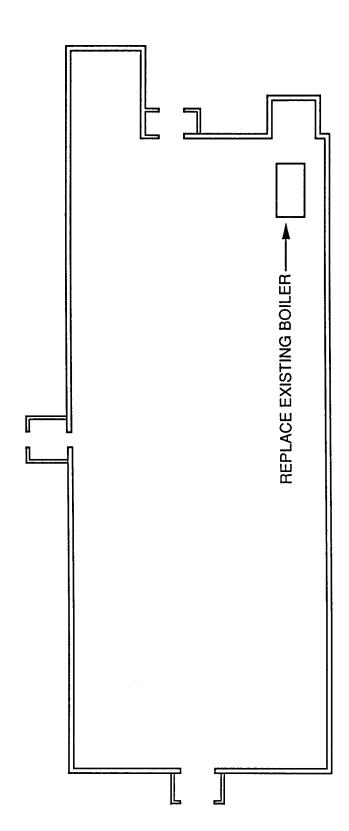
Page-34



Page-35

BUILDING 429 - FIRST FLOOR ECO - M7 Not to Scale

BASIS FOR CALCULATION ESOS CATION FORT LEAVENWORTH CLARK BICHARDSON & BISKUP CLARK BICHARDSON & BISKUP CLARK BICHARDSON & BISKUP CLARK BICHARDSON & BISKUP CLARK BICHARDSON & BISKUP COMPUTED BY DITHER (SPECIFY) BIN M COMPUTED BY DITHER (STATUS) DITHER (STATUS) DITHER (SPECIFY) BIN M COMPUTED BY DITHER (SPECIFY) BIN M COMPUTED BY DITHER (SPECIFY) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) DITHER (STATUS) D	0F 1
CATION FORT LEAVENWORTH CHITECT/ENGINEER CLARK RICHARDSON & BISKUP O MEASURE BOG, #1009 M7 UPGRADE HVAC CONTROLS ENERGY SAVINGS EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER YEAR 136 / \$1.550 = \$1.550 = \$4.19	
FORT LEAVENWORTH CHITECT/ENGINEER CLARK RICHARDSON & BISKUP CLARK RICHARDSON & BISKUP CMEASURE DG. #1009 M7 UPGRADE HVAC CONTROLS ENERGY SAVINGS EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
CLARK RICHARDSON & BISKUP O MEASURE DG. #1009 M7 UPGRADE HVAC CONTROLS ENERGY SAVINGS EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	1 S
O MEASURE DG. #1009 M7 UPGRADE HVAC CONTROLS ENERGY SAVINGS EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	METHO
ENERGY SAVINGS EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) 659.00 MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 523.00 EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 212.00 MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) 185.00 MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$33.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136	
MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YR.) EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
MODIFIED BUILDING COOLING ENERGY USAGE (MBTU PER YR.) MBTU'S SAVED PER YR. 163.00 MBTU HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
HEATING MBTU SAVED/BOILER EFFICIENCY = TOTAL MBTU SAVED PER YEAR 136 / 60% = 226.67 HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
226.67 X \$3.15 = \$714 COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU = DOLLARS SAVED PER Y 27.00 X \$15.50 = \$419	
27.00 X \$15.50 = \$419	YEAR
ENERGY SAVINGS PER YEAR \$1,133	YEAR
ENERGY SAVINGS PER YEAR \$1,133	
ENERGY SAVINGS PER YEAR \$1,133	



Not to Scale ECO-M7

LIFE CYCLE COST ANALYSIS SUMMARY **ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)** STUDY: FTLVGRUP

INSTALLATION & LOCATION: FT LEAVENWORTH

LCCID 1.001 REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

FISCAL YEAR 1987

DISCRETE PORTION NAME: GROUP 3

ANALYSIS DATE: 07-10-89

ECONOMIC LIFE 15 YEARS PREPARED BY: CRB

 INVESTMENT 	1.	INV	EST	MEN.	Ī
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A. CONSTRUCTION COST	\$	103610.
B. SIOH	\$	10361.
C. DESIGN COST	\$	5181.
D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	107236.
E. SALVAGE VALUE COST `	-\$	0.
F. TOTAL INVESTMENT (1D-1F)	\$	107236.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL		INIT COST /MBTU(1)	SAVINGS MBTU/YR(2)		NNUAL \$ AVINGS(3)	DISCOUNT FACTOR(4)	SCOUNTED VINGS(5)
A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$	15.50 .00 .00 3.15 .00	3686. 0. 0. 7197. 0.	\$ \$ \$ \$ \$	57139. 0. 0. 22671. 0.	8.59 11.28 12.01 12.76 10.17	490826. 0. 0. 289276. 0.
F. TOTAL			10883.	\$	79810.		\$ 780102.

3. NON ENERGY SAVINGS(+) / COST(-)

ARIRILAR	DECLIDONIO (/)	

9.11

A. ANNUAL RECURRING (+/-) (1) DISCOUNT FACTOR (TABLE A) (2) DISCOUNTED SAVING/COST (3A X 3A1)

0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)

0.

0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)

257434.

A IF 3D1 IS = OR > 3C GO TO ITEM 4

B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=

C IF 3D1B IS = > 1 GO TO ITEM 4

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))

79810.

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

780102.

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY) (SIR)=(5/1F)=

7.27

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												Foru	se of th				and DA Pam		
	NGE	D	OCL	MEI	NT N	UМ			BUILDI	NG/FA	CILITY		DATE	T					
TRANS CODE	CHA	REQ		NUN		7			NUMBE		SUFFIX		мо	DA			R FUND CITATION		
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ontr Mo ain.	The buildings will continue to waste energy by allowing wide temperature swings and uneven temperature control. This causes building occupants to register complaints, or to try to fix the problem themselves which will waste even more energy. Opening a window to correct an overheating problem (which is a common solution) is an extreme waste of energy and money. This ECO would save approximately 10,883 million BTU's per year.													
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WHITE (ORIGINAL) - PROJECT FILE COPY
PINK - FORWARD TO KEYPUNCH AFTER COMPLETION
OF "APPROVAL ACTION" BLOCK

EEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK



ENERGY CONSERVATION ANALYSIS ESOS

	PROJECT GROUP	ECCO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 4 Replace Incandescent						
	Building 50	ECO-E3	7.3	\$113	\$202	1.8	6.57
52	Building 52	ECO-E3	2.7	\$87	\$591	6.8	1.57
77	Building 77	ECO-E3	26.5	\$411	\$1,082	2.6	4.46
102	Building 102	ECO-E3	1.0	\$67	\$72	1.1	4.65
136	Building 136	ECO-E3	12.9	\$268	\$486	1.8	6.15
345	Building 345	ECO-E3	4.2	\$143	\$384	2.7	3.9
	GROUP 4 TOTALS		54.6	\$1,089	\$2,817	2.6	4.3

ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
	2/6/87	1 1
PROJECT	BASIS FOR CALCULA	TION
ESOS		
LOCATION	HAND CAL	CULATIONS
FORT LEAVENWORTH	X COMPUTE	RCALCULATIONS
ARCHITECT/ENGINEER	CONTRACT	FOR BID
CLARK RICHARDSON & BISKUP	OTHER (SPECIFY) BIN METHOD
ECO MEASURE	COMPUTED BY	CHECKED BY
E-3 INCANDESCENT REPLACEMENT SAVINGS	WBF	MAW

BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS

BUILDING #50 1703 TOTAL

1703 TOTAL WATTS REDUCTION

RECIEVING DOCK - CHANGE 2 LAMPS FROM 100W TO 90W

STORAGE AREA - CHANGE 1 LAMP FROM 70W TO 57W

LOUNGE AREA - CHANGE 2 LAMPS FROM 100W TO 90W

BSMT STORAGE - CHANGE 4 LAMPS FROM 200W TO 90W

MECHANICAL RM - CHANGE 11 LAMPS FROM 200W TO 90W

			lauser of		
	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF		
DDO IFOT		2/87 BASIS FOR CALCULATION] 1 1 ON		
PROJECT	ESOS	BASIST ON CALCULATI	5. ,		
LOCATION		X HAND CALCULATIONS			
	FORT LEAVENWORTH	COMPUTER CALCULATIONS			
ARCHITEC	T/ENGINEER	CONTRACTO	OR BID		
ECO MEAS	CLARK RICHARDSON & BISKUP	OTHER (SPECIFY) COMPUTED BY CHECKED BY			
	E-3 INCANDESCENT REPLACEMENT SAVINGS	DLH	0,1201125 01		
	The second secon				
	ENERGY SAVINGS				
	EXISTING BUILDING LIGHTING USAGE	42 230	WATTS		
	INCANDESCENT REPLACEMENT BUILDING LIGHTING USA		WATTS		
	THE DESIGNATION OF THE PROPERTY DOLLOWS CONTINUE OF THE		-		
	WATTS SAVED 1,703 WATTS				
	HRS. PER DAY X DAYS PER WEEK X WEEKS PER YEAR	LESS HOLIDAYS = HRS.	USED PER YEAR		
	THIS, I LIT DAT A DATOT EN WEEK A WEEKSTEN TEARS				
	5 X 5 X 52	2-2 =	1,250		
		TOTAL =	1,250 HR.		
	HRS. USED PER YEAR X WATTS SAVED = KWH SAVED	PER YEAR			
	1,250 X $1,703$ = $2,129$				
	MANUEL DED VEAD V MATTE DED MOTH MOTH	AVED DED VEAD			
	KWH SAVED PER YEAR X WATTS PER MBTU = MBTU S. 2,129 X 3.41E-03 =	7.3			
	·		_		
	MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBT	U = DOLLARS SAVED P	ER YEAR		
	7.3 X \$15.50	= \$113			
	ENERGY COST SAVINGS PER YEAR \$113				
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ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
	2/6/87	1 1
PROJECT	BASIS FOR CALCULAT	ION
ESOS		
LOCATION	HAND CALC	CULATIONS
FORT LEAVENWORTH	X COMPUTER	R CALCULATIONS
ARCHITECT/ENGINEER	CONTRACT	OR BID
CLARK RICHARDSON & BISKUP	OTHER (S	SPECIFY) BIN METHOD
ECO MEASURE	COMPUTED BY	CHECKED BY
E-3 INCANDESCENT REPLACEMENT SAVINGS	WBF	MAW

BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS

BUILDING #52

1220 TOTAL WATTS REDUCTION

GRANT HALL

1150 WATTS REDUCTION

OFFICE 246 - CHANGE 1 LAMP FROM 100W TO 90W.

AUDITORIUM 317 - CHANGE 36 LAMPS FROM 150W TO 120W

CORRIDOR 318 - CHANGE 1 LAMPS FROM 100W TO 90W

PROJECTION ROOM- CHANGE 5 LAMPS FROM 100W TO 90W.

SHERIDAN HALL

40 WATTS REDUCTION

CORRIDOR 150- CHANGE 4 LAMPS FROM 100W TO 90W.

SHERMAN HALL 30 WATTS REDUCTION

ENTRY 119A - CHANGE 1 LAMPS FROM 100W TO 90W

OFFICE 125B - CHANGE 1 LAMPS FROM 100W TO 90W

ENTRY 125B - CHANGE 1 LAMPS FROM 100W TO 90W

	- 				
	ENERGY SAVINGS CALCULATION SHEET	DATE PRE 2/87		SHEET 1	0F 1
PROJECT	ESOS	BASIS FOF	CALCULATION	ON	
LOCATION	FORT LEAVENWORTH	X	HAND CALCUCOMPUTER CONTRACTO	CALCULAT	ONS
IARCHITEC	T/ENGINEER CLARK RICHARDSON & BISKUP		OTHER (SI	PECIFY) BI	N METHOD
ECO MEAS	SURE	COMPUTE	D BY DLH	CHECKE) BY
	BLDG. #52 E-3 REPLACE INCANDESCENT SAVINGS	L_,	ULT .		
	ENERGY SAVINGS				
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER		4,219.62 4,223.35		
	EXISTING BUILDING ELECTRICAL ENERGY USAGE (KWH P MODIFIED BUILDING ELECTRICAL ENERGY USAGE (KWH P	ER YR.) PER YR.)	839,769 837,893		
	MBTU'S SAVED PER YR. 2.67 MBTU				
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS -3.73 X \$3.15	PER MBTU =	= DOLLARS (\$12)	SAVED PE	ER YEAR
	ELECTRICAL MBTU SAVED PER YEAR X AVERAGE DOLLA 6.40 X \$15.50	.RS PER ME =	BTU = DOLLA \$99	ARS SAVEI	O PER YEAR
	ENERGY SAVINGS PER YEAR \$87				

	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
PROJECT		2/6/87 BASIS FOR CALCULAT	1 1
	ESOS		
LOCATION	FORT LEAVENWORTH	HAND CALC	ULATIONS CALCULATIONS
ARCHITECT	ENGINEER	CONTRACT	OR BID
ECO MEASU	CLARK RICHARDSON & BISKUP	COMPUTED BY	PECIFY) BIN METHOD CHECKED BY
	E-3 INCANDESCENT REPLACEMENT SAVINGS	WBF	MAW
	BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOC	ATIONS	
	BUILDING #77 2985 TOTAL WATTS REDUCTION		
	150 PAPER STORAGE - CHANGE 54 -150W LAMPS TO 120W. 150 PAPER STORAGE - CHANGE 26 -100W LAMPS TO 75W.		2270 W
	126 CONF. ROOM - CHANGE 5 -75W LAMPS TO 50W.		125 W
	ELEVATOR ROOM - CHANGE 3 -300W LAMPS TO 120W.		540 W
	MECHANICAL ROOM - CHANGE 2 - 100W LAMPS TO 75W.		50
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	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF		
PROJECT	FCOC	BASIS FOR CALCULATION			
LOCATION	ESOS	X HAND CALCULATIONS			
	FORT LEAVENWORTH	COMPUTER CALCULATIONS			
ARCHITEC	T/ENGINEER CLARK RICHARDSON & BISKUP	CONTRACTO	PECIFY)		
ECO MEAS	SURE	COMPUTED BY	CHECKED BY		
BLDG. #77	E-3 INCANDESCENT REPLACEMENT SAVINGS	DLH	<u> </u>		
	ENERGY SAVINGS				
	EXISTING BUILDING LIGHTING USAGE INCANDESCENT REPLACEMENT BUILDING LIGHTING USAGE		WATTS		
	WATTS SAVED <u>2,985</u> WATTS				
	- · · · · · · · · · · · · · · · · · · ·	LESS HOLIDAYS = HRS. (2-2 = 7-2 = TOTAL =	USED PER YEAR 2,000 600 2,600 HR.		
	HRS. USED PER YEAR X WATTS SAVED = KWH SAVED 2,600 X 2,985 = 7,761				
	KWH SAVED PER YEAR X WATTS PER MBTU = MBTU S. 7,761 X 3.41E-03 =	AVED PER YEAR 26.5			
	MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBT 26.5 X \$15.50	U = DOLLARS SAVED P = \$411	ER YEAR		
	ENERGY COST SAVINGS PER YEAR \$411				

	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/6/87	SHEET OF 1 1
PROJECT	ESOS	BASIS FOR CALCULA	
LOCATION	FORT LEAVENWORTH		CULATIONS ER CALCULATIONS
ARCHITECT	/ENGINEER	CONTRAC	TOR BID
ECO MEASI		COMPUTED BY	(SPECIFY) BIN METHOD CHECKED BY
	E-3 INCANDESCENT REPLACEMENT SAVINGS	WBF	MAW
	BUILDING WATTS WERE REDUCED IN THE FOLLOWING LO	CATIONS	
	BUILDING #102 170 TOTAL WATTS REDUCTION		
	TOILETS- CHANGE 3 -100W LAMPS TO 90W.		30 W
	MECHANICAL ROOM - CHANGE 1 - 150W LAMP TO 90W.		60 W
	LOUNGE - CHANGE 2 -100W LAMPS TO 90W.		20 W
	PORCH - CHANGE 1 - 150W LAMP TO 90W.		60 W
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	ENERGY SAVINGS CALCULATION SHEET	DATE 2/87	PREPARED	SHEET 1	0F 1
PROJECT	ESOS		FOR CALCULAT	ION	
LOCATION	FORT LEAVENWORTH	x		R CALCULA	
	T/ENGINEER CLARK RICHARDSON & BISKUP		CONTRACT OTHER (S	SPECIFY) E	BIN METHOD
ECO MEAS	SURE BLDG. #102 E-3 REPLACE INCANDESCENT SAVINGS	СОМР	UTED BY DLH	CHECKE	D BY
	ENERGY SAVINGS				
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER	R YR.) R YR.)	950.0 953.6		
	EXISTING BUILDING ELECTRICAL ENERGY USAGE (KWH P MODIFIED BUILDING ELECTRICAL ENERGY USAGE (KWH F	ER YR. PER YR) <u>136,08</u> .) <u>134,59</u>		
	MBTU'S SAVED PER YR. 1.44 MBTU				
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS -3.65 X \$3.15	PER M =	BTU = DOLLAR: (\$1:	S SAVED P 1)	PER YEAR
	ELECTRICAL MBTU SAVED PER YEAR X AVERAGE DOLLA 5.09 X \$15.50	ARS PE	R MBTU = DOLL \$79	_ARS SAVE 9	ED PER YEAR
	ENERGY SAVINGS PER YEAR \$67				
1					

ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/6/87	SHEET OF
PROJECT ESOS	BASIS FOR CALCULA	TIÓN
LOCATION FORT LEAVENWORTH		CULATIONS R CALCULATIONS
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP	CONTRAC	TOR BID (SPECIFY) BIN METHOD
ECO MEASURE E-3 INCANDESCENT REPLACEMENT SAVINGS	COMPUTED BY WBF	CHECKED BY MAW

BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOCATIONS BUILDING #136 900 TOTAL WATTS REDUCTION 240 W TOILETS- CHANGE 24 -100W LAMPS TO 90W. 90 W CORRIDORS - CHANGE 9 -100W LAMPS TO 90W 40 W STAIRS - CHANGE 4 -100W LAMPS TO 90W 10 W JANITOR - CHANGE 1 -100W LAMP TO 90W 150 W JANITOR - CHANGE 1 -300W LAMP TO 150W 300 W EQUIP. RM 208 - CHANGE 2-300W LAMPS TO 150W. EQUIP. RM 209 - CHANGE 4-100W LAMPS TO 90W. 40 W 20 W ENTRY - CHANGE 2-100W LAMPS TO 90W. 10 W KITCHEN - CHANGE 1-100W LAMP TO 90W.

	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED SHEET 0F 2/6/87 1 1
PROJECT	ESOS	BASIS FOR CALCULATION
OCATION	FORT LEAVENWORTH	HAND CALCULATIONS COMPUTER CALCULATIONS
ARCHITECT	/ENGINEER CLARK RICHARDSON & BISKUP	CONTRACTOR BID OTHER (SPECIFY) BIN MET
ECO MEASI		COMPUTED BY CHECKED BY WBF MAW
	BUILDING WATTS WERE REDUCED IN THE FOLLOWING	LOCATIONS
	BUILDING #345 630 TOTAL WATTS REDUCTION	
	TOILETS- CHANGE 4 -100W LAMPS TO 90W.	40 W
	TOILETS- CHANGE 2 -200W LAMPS TO 150W.	100 W
	TOILETS- CHANGE 1 -150W LAMPS TO 90W.	60 W
	CORRIDORS - CHANGE 3 -200W LAMPS TO 150W	150 W
	CORRIDORS - CHANGE 2 -100W LAMP TO 90W	20 W
	CLOSET - CHANGE 1 -100W LAMP TO 90W	10 W
	LOCKER/SHOWERS - CHANGE 21 -100W LAMP TO 90W	210 W
	BREAK RM - CHANGE 2-100W LAMPS TO 90W.	20 W
	HEAT ROOM - CHANGE 1-100W LAMP TO 90W.	10 W
	BOILER ROOM - CHANGE 1-100W LAMP TO 90W.	10 W

	ENERGY SAVINGS CALCULATION SHEET	DATE PREPAR	ED	SHEET	OF .
PROJECT		2/87 BASIS FOR CA	CULATION	DN	1
	ESOS				
LOCATION	FORT LEAVENWORTH	X COM	ID CALCU IPUTER (NTRACTO	JLATIONS CALCULAT	TIONS
ARCHITEC	T/ENGINEER CLARK RICHARDSON & BISKUP	0	THER (SI	PECIFY) B	IN METHOD
ECO MEAS	SURE	COMPUTED BY		CHECKE	O BY
	BLDG. #345 E-3 REPLACE INCANDESCENT SAVINGS	DLF	<u> </u>		
	ENERGY SAVINGS				
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER	YR.)	2,927.66 2,934.00	•	
	EXISTING BUILDING ELECTRICAL ENERGY USAGE (KWH P MODIFIED BUILDING ELECTRICAL ENERGY USAGE (KWH F	ER YR.) ER YR.)	116,342 113,266		
	MBTU'S SAVED PER YR. 4.16 MBTU				
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS -6.34 X \$3.15	PER MBTU = [=	OLLARS (\$20)	SAVED P	ER YEAR
	ELECTRICAL MBTU SAVED PER YEAR X AVERAGE DOLLA 10.50 X \$15.50	RS PER MBTU =	= DOLLA \$163	ARS SAVE	D PER YEAF
	ENERGY SAVINGS PER YEAR \$143				

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: FTLVGRUP

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LCCID 1.001

INSTALLATION & LOCATION: FT LEAVENWORTH

REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

FISCAL YEAR 1987 DISCRETE PORTION NAME: GROUP 4

ANALYSIS DATE: 07-10-87 ECONOMIC LIFE 25 YEARS PREPARED BY: CRB

1.	INVESTMENT		
	A. CONSTRUCTION COST	\$	2561.
	B. SIOH	\$	256.
	C. DESIGN COST	\$	128.
	D. ENERGY CREDIT CALC (1A+1B+1C) X.9	\$	2651.
	E. SALVAGE VALUE COST `	-\$	0.
	F. TOTAL INVESTMENT (1D-1E)	\$	2651.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL		JNIT COST /MBTU(1)	SAVINGS MBTU/YR(2)		INUAL \$ VINGS(3)	DISCOUNT FACTOR(4)	COUNTED VINGS(5)
A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$	15.50 .00 .00 3.15 .00	74. 0. 0. -19. 0.	\$ \$ \$ \$ \$ \$	1149. 0. 0. -60. 0.	11.05 16.73 17.67 19.36 13.47	12700. 0. 0. -1171. 0.
F. TOTAL			55.	\$	1089.		\$ 11529.
. NON ENERGY	Y SA\	/INGS(+) / C	OST(-)				

3.

A. ANNUAL RECURRING (+/-)	\$ 0.
(1) DISCOUNT FACTOR (TABLE A) 11.65 (2) DISCOUNTED SAVING/COST (3A X 3A1)	\$ 0.
C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)	\$ 0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$ 3805.
A IF 3D1 IS = OR > 3C GO TO ITEM 4	
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=	
C IF 3D1B IS = > 1 GO TO ITEM 4	
D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY	

1089. 4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))

11529. 5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

6. DISCOUNTED SAVINGS RATIO (SIR)=(5/1F)=4.35 (IF < 1 PROJECT DOES NOT QUALIFY)

													FACILI	TIES EN	GINEERI	NG WO	RK REQUEST -
<u></u>	1 111		CUMEN	T 811 184	000		BUILDIN	IG/FAI	CILITY	For u	DATE	is form	, see AH 4	120-17 an	d DA Pam	420-6; (he proponent agenc
TRANS		REQ	SERI	AL.	۲	TYPE	NUMBE		SUFFIX	YR	мо	DA	OTHE	R FUND (CITATION		
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בנינה	GE	DC	CUMEN	T NUM	BEF		BUILDIN			В	UILDIN	IG/FA	CILITY	BUIL	ING/FAC	LITY	BUILDING/F
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	Replace existing incandescent lights with lower wattage incandescent lights or with more efficient fluorescent lamps. Lamp changes will reduce the amount of electrical energy used for lighting and air conditioning without adversely affecting light levels. Also, fairly low cost project, much of which can be done by Fort maintenance personnel. REQUESTER INFORMATION																
NAME							ORGANI	ZATIO	N			TELE	HONE N	O. SIGN	ATURE		NAN
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ENERGY CONSERVATION ANALYSIS ESOS

	PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 5 Insulate Steam Lines						
1009	Building 102 Building 1009 USDB Overall	ECO-M5 ECO-M5 ECO-M5	216.3 78.5 1479.0	\$248	\$1,015 \$432 \$10,486	1.5 1.7 2.3	9.10 7.77 6.02
	GROUP 5 TOTALS	200	1773.8		\$11,933	2.1	6.35

	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED FEB. 10, 1987	SHEET OF 1			
PROJECT	FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCULAT	ÔN			
LOCATION			CULATIONS R CALCULATIONS			
ARCHITECT	VENGINEER CLARK RICHARDSON & BISKUP	CONTRACTOR BID OTHER (SPECIFY)				
ECO MEAS	URE INSULATE STEAM LINES	COMPUTED BY MAW	CHECKED BY DEC			

HEAT LOSS VALUES OBTAINED FROM TABLE M5-2

HEAT LOSS PER FOOT OF PIPE 15 PSIG STEAM. TEMP =250°F AMBIENT TEMPERATURE = 68°F

COST OF STEAM - \$3.15 / 70% SYSTEM EFF. = \$4.50 PER MILLION BTU

		BARE PIPE	2" INSUL.	SAVINGS		SAVINGS		\$PER FT
PIPE	TEMP	LOSS	LOSS	DIFF.	HOURS/	1000 BTU	\$ SAVINGS	INSLU.
SIZE	DIFF.	BTUH/LF/°F	BTUH/LF/°F	BTUH/LF/°F	YEAR	PER LF/YR	PER LF/YR	COST
2"	182°F	1.53	0.151	1.379	4,380	1,099	\$4.95	\$7.85
3"	182°F	2.15	0.195	1.955	4,380	1,558	\$7.01	\$8.95
4"	182°F	2.65	0.231	2.419	4,380	1,928	\$8.68	\$10.60

HEAT LOSS PER FOOT OF PIPE CONDENSATE LINE TEMP =180°F AMBIENT TEMPERATURE = 68°F

COST OF STEAM - \$3.15 / 70% SYSTEM EFF. = \$4.50 PER MILLION BTU

PIPE	TEMP	BARE PIPE LOSS	2" INSUL. LOSS	SAVINGS DIFF.	HOURS/	SAVINGS 1000 BTU	\$ SAVINGS	\$PER FT INSLU.
SIZE	DIFF.		BTUH/LF/°F			PER LF/YR		COST
1"	112°F	0.93	0.108	0.822	4,380	403	\$1.81	\$7.85
2"	112°F	1.53	0.151	1.379	4,380	676	\$3.04	\$8.95
4"	112°F	2.65	0.231	2.419	4,380	1,187	\$5.34	\$10.60
6*	112°F	3.7	0.305	3.395	4,380	1,665	\$7.49	\$12.80
8*	112°F	4.75	0.388	4.362	4,380	2,140	\$9.63	\$15.95

ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
	FEB. 10, 1987	1 1
PROJECT FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCULATI	
LOCATION		CULATIONS ER CALCULATIONS
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP	CONTRAC OTHER	(SPECIFY)
ECO MEASURE INSULATE STEAM LINES	COMPUTED BY MAW	CHECKED BY DEC

BUILDING NO. 1009

15 PSI STEAM

PIPE SIZE	FEET OF UNINSULTED PIPE	1000 BTU PER YEAR SAVED	\$ SAVED PER YEAR	COST OF INSUL. \$
2*	50	54,964	\$247	\$393
	BUILDING TOTAL	. = 54,964	\$247	\$393

BUILDING NO. 102

15 PSI STEAM

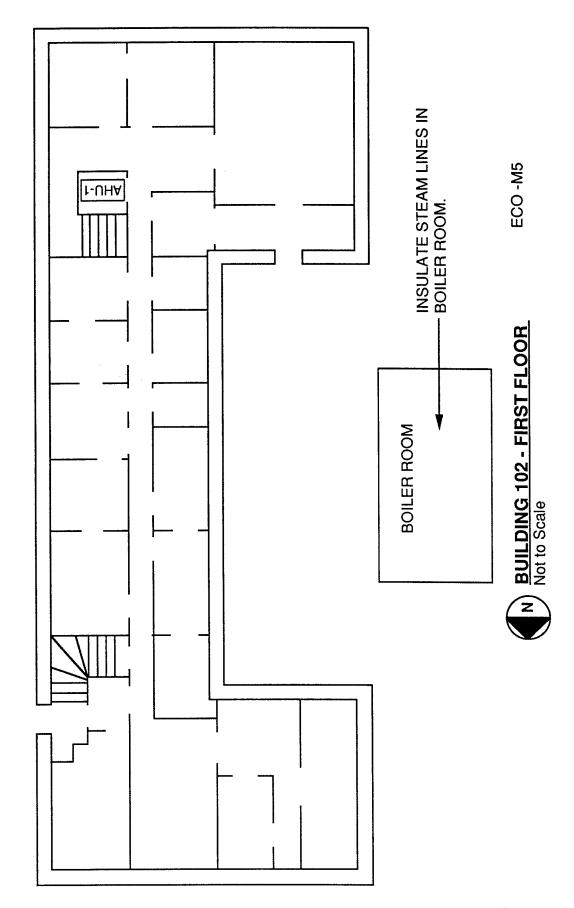
PIPE SIZE	FEET OF UNINSULTED PIPE	1000 BTU PER YEAR SAVED	\$ SAVED PER YEAF	COST OF INSUL. \$
2"	50	54,964	\$247	\$393
4"	50	96,417	\$434	\$530
	BUILDING TOTAL	.= 151,381	\$681	\$923

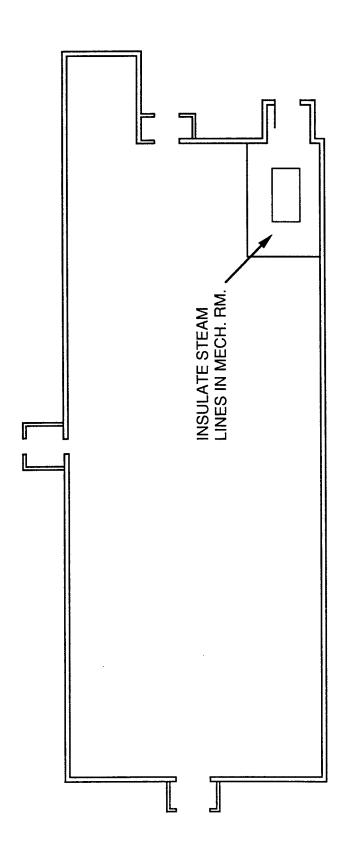
ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
	FEB. 10, 1987	1 1
PROJECT FORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCULAT	ION
LOCATION		LCULATIONS ER CALCULATIONS
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP		CTOR BID (SPECIFY)
ECO MEASURE INSULATE STEAM LINES	COMPUTED BY MAW	CHECKED BY DEC

USDB OVERALL

15 PSI STEAM	15	PS	IS	TΕ	AM
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BUILDING		FEET OF UNINSULTED PIPE	1000 BTU PER YEAR · SAVED	\$ SAVED PER YEAR	COST OF INSUL.\$
468	3 2"	10	10,993	\$49	\$79
471	3"	170	264,936	\$1,192	\$1,522
472	2 2"	10	10,993	\$49	\$79
485	5 2"	150	164,893	\$742	\$1,178
486	3 2 "	20	21,986	\$99	\$157
496	3 2"	150	164,893	\$742	\$1,178
		15 PSI TOTAL =	638,693	\$2,874	\$4,191
CONDENS	SATE LINE				
STEAM TUNNEL	8"	60	128,389	\$578	\$957
466	5 2"	30	20,294	\$91	\$269
468	3 1"	10	4,032	\$18	\$79
47	2"	170	115,002	\$518	\$1,522
485	5 1"	150	60,486	\$272	\$1,178
486	5 1"	20	8,065	\$36	\$157
496	5 1"	150	60,486	\$272	\$1,178
	CONDENSATE	LINE TOTAL =	396,755	\$1,785	\$5,338







ECO-M5

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: FTLVGRUP

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LCCID 1.001

INSTALLATION & LOCATION: FT LEAVENWORTH

REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

FISCAL YEAR 1987

ANALYSIS DATE: 05-31-89

DISCRETE PORTION NAME: GROUP 5

ECONOMIC LIFE 15 YEARS

PREPARED BY: CRB

1.	INVESTMENT		
	A. CONSTRUCTION COST	\$	10848.
	B. SIOH	\$	1085.
	C. DESIGN COST	\$	542.
	D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	11228.
	E. SALVAGE VALUE COST `	-\$	0.
	F. TOTAL INVESTMENT (1D-1E)	\$	11228.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL		INIT COST /MBTU(1)	SAVINGS MBTU/YR(2)		INUAL \$.VINGS(3)	DISCOUNT FACTOR(4)	COUNTED /INGS(5)
A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$	15.50 .00 .00 3.15 .00	0. 0. 0. 1774. 0.	\$ \$ \$ \$ \$ \$ \$	0. 0. 0. 5588. 0.	8.59 11.28 12.01 12.76 10.17	0. 0. 0. 71300. 0.
F. TOTAL			1774.	\$	5588.		\$ 71300.

3. NON ENERGY SAVINGS(+) / COST(-)

A.	ANNUAL RECURRING (+/-)		\$ 0.
	(1) DISCOUNT FACTOR (TABLE A) (2) DISCOUNTED SAVING/COST (3A X 3A1)	9.11	\$ 0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4) 0.

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$ 23529.
A IF 3D1 IS = OR > 3C GO TO ITEM 4	
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=	
C IF 3D1B IS = > 1 GO TO ITEM 4	

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

5588. 4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))

71300. 5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

6. DISCOUNTED SAVINGS RATIO 6.35 (SIR)=(5/1F)=(IF < 1 PROJECT DOES NOT QUALIFY)

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- FORWARD TO KEYPUNCH AFTER COMPLETION
OF "APPROVAL ACTION" BLOCK

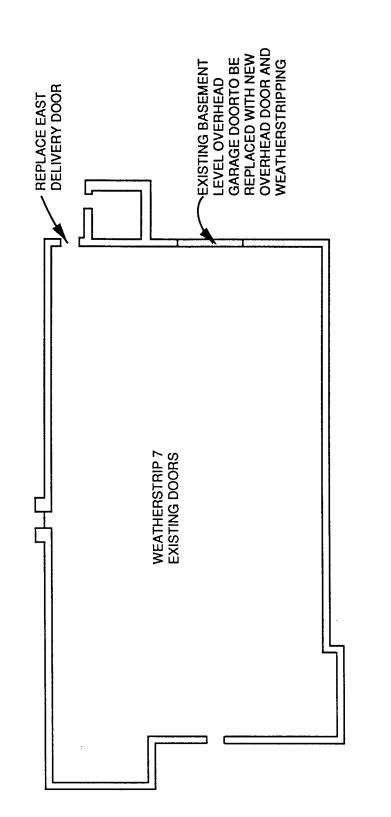
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COMPLETION OF "FORWARD FOR
APPROVAL" BLOCK



ENERGY CONSERVATION ANALYSIS ESOS

	PROJECT GROUP	ECCO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 6 Reduce Infiltration						
25 77 345 345 1008	Building 25 Building 25 Building 77 Building 345 Building 345 Building 1008 Building 1009 GROUP 6 TOTALS	ECO -A3 ECO -A3 ECO -A3 ECO -A6 ECO -A3 ECO -A5	224.0 167.0 39.0 18.0 60.0 130.0 146.0 784.0	\$525 \$517 \$66 \$206 \$621 \$683	\$5,294 \$6,379 \$5,811 \$314 \$1,004 \$4,253 \$6,832 \$29,887	4.9 12.2 11.2 4.8 4.9 6.8 10.0	

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	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF
PROJECT		BASIS FOR CALCULATION	
LOCATION	ESOS	HAND CALC	II ATIONS
LOCATION	FORT LEAVENWORTH	HAND CALCU COMPUTER (CALCULATIONS
ARCHITEC	T/ENGINEER	CONTRACTO	R BID
EOO MENG	CLARK RICHARDSON & BISKUP	X OTHER (SP	ECIFY) BIN METHOD CHECKED BY
ECO MEAS BLDG. #2	5 A3 WEATHERIZATION SAVINGS	DFH	CHECKED B1
	ENERGY SAVINGS		
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	EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YFINSULATION BUILDING COOLING ENERGY USAGE (MBTU PER		
	MBTU'S SAVED PER YR. 147.00 MBTU		
	HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL M 116.00 / 60% = 193.33		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS PI 193.33 X \$3.15	ER MBTU = DOLLARS SA = \$609	VED PER YEAR
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS P 31.00 X \$15.50	ER MBTU = DOLLARS S/ = \$481	AVED PER YEAR
	ENERGY SAVINGS PER YEAR \$1,090		
			·



BUILDING 25 ECO-A3

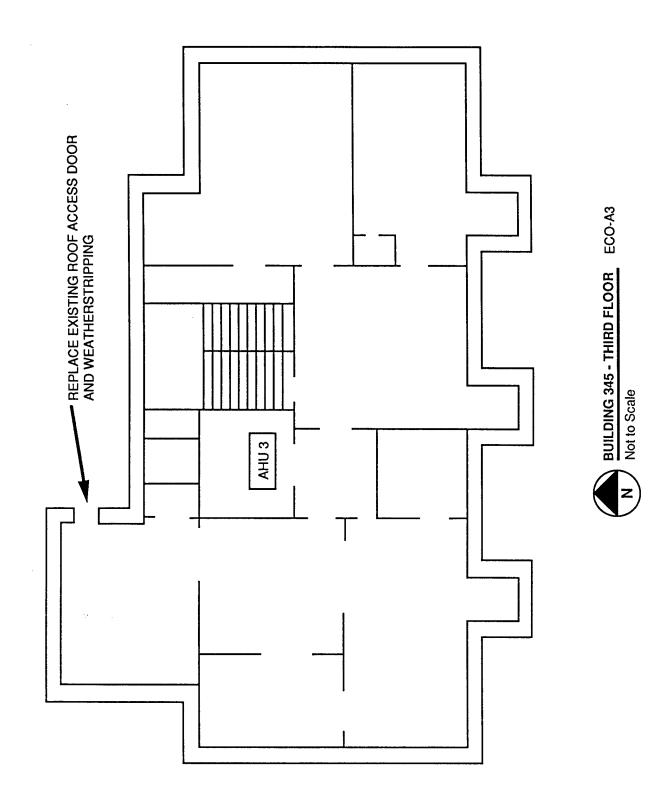
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	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF
PROJECT		BASIS FOR CALCULATION	
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LOCATION		HAND CALCU	
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	MBTU'S SAVED PER YR. 100.00 MBTU		
	HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL M 100.00 / 60% = 166.67		
	MBTU SAVED PER YEAR X AVERAGE DOLLARS PER MBTU 166.67 X \$3.15	= DOLLARS SAVED PEF = \$525	RYEAR
	COOLING MBTU SAVED PER YEAR =0 BUILDING NOT AIR CONDITIONED		
	ENERGY SAVINGS PER YEAR \$525		

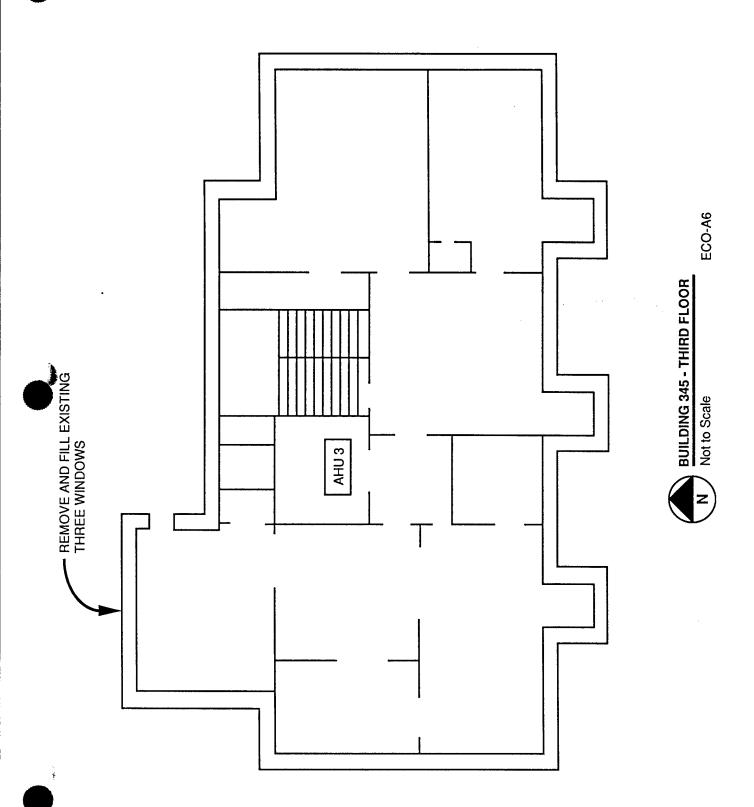


	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
DDO (COT		2/87 BASIS FOR CALCULATION	1 1
PROJECT	ESOS	BASIS FOR CALCULATIC	/N
LOCATION		HAND CALCU	JLATIONS
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ECO MEAS	CLARK RICHARDSON & BISKUP	X OTHER (SP	ECIFY) BIN METHOD CHECKED BY
	7 A3 WEATHERIZATION SAVINGS	DLH	OFFICIALS BY
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YF INSULATION BUILDING HEATING ENERGY USAGE (MBTU PER		
; ;	EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER YFINSULATION BUILDING COOLING ENERGY USAGE (MBTU PER	R.) 1,239.00 R YR.) 1,207.00	
	MBTU'S SAVED PER YR. 36.00 MBTU		
	HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL M 4.00 / 60% = 6.67		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS P	ER MBTU = DOLLARS SA = \$21	AVED PER YEAR
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS P 32.00 X \$15.50	ER MBTU = DOLLARS S = \$496	AVED PER YEAR
		programme and the second	
		gestavet er en en en en en en en en en en en en en	
	ENERGY SAVINGS PER YEAR \$517		
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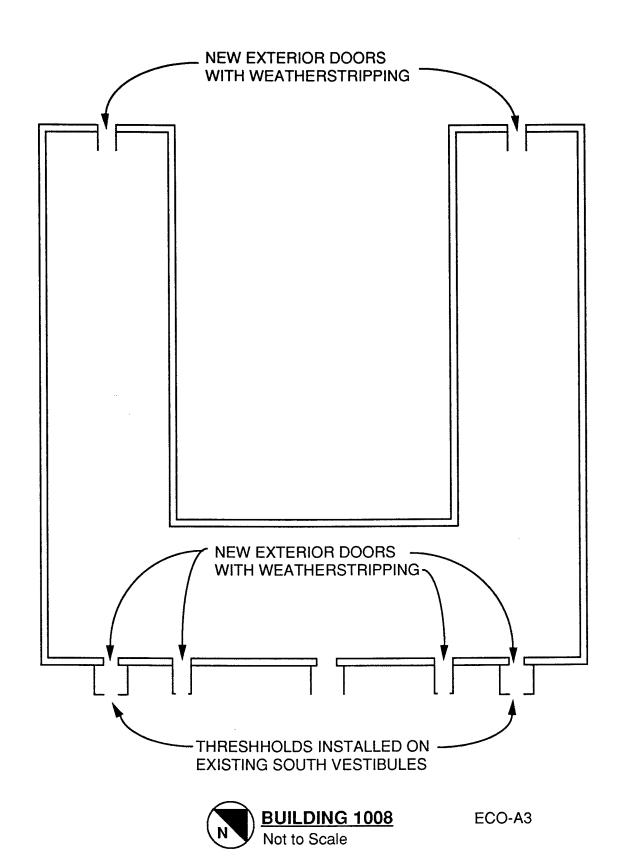
	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF 1 1
PROJECT	ESOS	BASIS FOR CALCULATION	ON
LOCATION	FORT LEAVENWORTH		CALCULATIONS
	T/ENGINEER CLARK RICHARDSON & BISKUP		PECIFY) BIN METHOD
ECO MEAS	SURE 145 A3 WEATHERIZATON SAVINGS	COMPUTED BY DLH	CHECKED BY
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YF MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YF	R.) 2,927.00 2,910.00	
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YF	.) 116,342 R.) 116,112	
	MBTU'S SAVED PER YR. 17.78 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS P 17.00 X \$3.15	ER MBTU = DOLLARS S. = \$54	
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS F	PER MBTU = DOLLARS S = \$12	
	ENERGY SAVINGS PER YEAR \$66		



	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED SHEET 1	0F 1			
OJECT		BASIS FOR CALCULATION				
CATIO	ESOS N	HAND CALCULATIONS				
	FORT LEAVENWORTH	X COMPUTER CALCULATIONS				
CHITE	CT/ENGINEER	CONTRACTOR BID				
O ME	CLARK RICHARDSON & BISKUP ASURE	OTHER (SPECIFY) BIN N				
	345 A-6 REDUCE GLASS AREA SAVINGS	COMPUTED BY CHECKED I				
	ENERGY SAVINGS					
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PE MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PE					
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER MODIFIED BUILDING COOLING ENERGY USAGE (KWH PE	R YR.) 116,342 R YR.) 115,964				
	MBTU'S SAVED PER YR. 60.19 MBTU					
	LIEATING MET LOAVED BED VEAD V. AVEDAGE BOLLAI					
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLAR 58.90 X \$3.15	RS PER MBTU = DOLLARS SAVED PER Y = \$186	EAR			
		_				
	COOLING METH CAVED DED VEAD Y AVEDAGE DOLLAR		·= 4 B			
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLA 1.29 X \$15.50	TS PER MBTU = DOLLARS SAVED PER Y = \$20	EAH			
	ENERGY SAVINGS PER YEAR \$206					
			and Ares			
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			•
	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF 1 1
PROJECT	ESOS	BASIS FOR CALCULATION	DN
LOCATION			CALCULATIONS
ARCHITEC	T/ENGINEER CLARK RICHARDSON & BISKUP	CONTRACTO X OTHER (SF	R BID PECIFY) BIN METHOD
ECO MEAS		COMPUTED BY	CHECKED BY
BLDG. #10	08 A-3 WEATHERIZATION	DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER INSULATION BUILDING HEATING ENERGY USAGE (MBTU P	YR.) 661.00 ER YR.) 593.00	
	EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER INSULATION BUILDING COOLING ENERGY USAGE (MBTU P	R YR.) 368.00 PER YR.) 351.00	
	MBTU'S SAVED PER YR. 85.00 MBTU		
	HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL 68.00 / 60% = 113.33		AR
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS 113.33 X \$3.15	PER MBTU = DOLLARS = \$357	SAVED PER YEAR
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS 17.00 X \$15.50	PER MBTU = DOLLARS = \$264	SAVED PER YEAR
	ENERGY SAVINGS PER YEAR \$621		



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3m 420	3-6; the propor	nent agency	is the Offic	e 01	the Citier of Li	igineers.			В	UILDING/FAC	ILITY		
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TO BE RMED HOUS	E FACIL	ITIES ENG	INEER			APPROV	/ED FC	OR DESIGN			DIREC	T MATIC !	четмв.
OP		DATE	1		s	IGNATUR	Ε		DA	TE			
				-	REMARKS								
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		TE (OBIGI	NAL) BB	L	CT FILE COPY	 	·		GREE	N - FORWA	RD TO	KEYPU	NCH AFTER

PINK - PROJECT FILE COPY
- FORWARD TO KEYPUNCH AFTER COMPLETION
OF "APPROVAL ACTION" BLOCK

EEN - FORWARD TO KEYPUNCH AFTER COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

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ENERGY CONSERVATION ANALYSIS ESOS

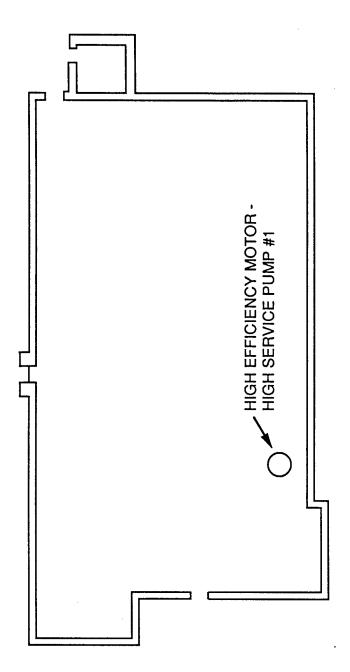
	PROJECT GROUP	ECO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 7 Replace Motors						
	Building 25	ECO-E4	150.1	\$2,327	\$14,793	7.0	1.68
	Building 345	ECO-E4	18.9		\$2,680	9.1	1.28
	Building 470 USDB Overall	ECO-E4 ECO-E4	26.7 136.0		\$3,469 \$18,206	8.4 8.6	1.40 1.36
5000	GROUP 7 TOTALS	<u> </u>	331.7		\$39,148	7.6	1.54

ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF			
	7/10/87	1 1			
PROJECTORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY					
LOCATION BUILDING 25 WATER TREATMENT PLANT	X HAND CALCULATIONS COMPUTER CALCULATIONS				
ARCHITECT/ENGINEER CLARK RICHARDSON & BISKUP	OTHER (SPECIFY)				
ECO MEASURE ENERGY EFFICIENT MOTORS	COMPUTED BY CHECKED	BY DEC			

MOTOR ENERGY SAVINGS

l									
QUAN.	DESCRIPTION	HP	WATT	OPER.	SAVINGS		INSTALLED		PAYBACK
			LOSS	HOURS/	PER YEAR	PER YEAR	COST	SIR	YEARS
1			SAVINGS	YEAR	MBTU'S	DOLLARS			
						604	6400	4.0	5.7
1	AIR COMPRESSOR	2	350	4380	5.2	\$81	\$466	1.9	5.7
1	CO2 COMPRESSOR	3	400	4380	6.0	\$93	\$582	1.8	6.3
2	PRIMING & BACK- WASH PUMPS	5	500	4380	14.9	\$232	\$1,288	2.0	5.6
1	LIME CONVEYOR	25	1300	4380	19.4	\$301	\$1,780	1.9	5.9
1	AIR COMPRESSORS	40	1700	4380	25.4	\$394	\$2,623	1.7	6.7
1	HIGH SERVICE PUMP #1	100	6800	4380	101.7	\$1,576	\$8,520	2.0	5.4
	TOTALS				172.7	\$2,676	\$15,259	1.9	5.7

25 YEAR DISCOUNT FACTOR 11.05







								AUGET		
	ENERGY SAVINGS	CALCU	LATION :	SHEET	DATE PRE			SHEET 1	OF.	
					21010 500	7/10/87	<u> </u>	<u> </u>		
PROJEC	FORT LEAVENWOR	TH			BASIS FOR	CALCULAT	ION		:	
	ENERGY SAVINGS	OPPOR	TUNITY	SURVEY	v	LIAND CALC	SIN ATIONS			
LOCATION	ON			0511750		HAND CALC		ONIC		
BUILDING 345 PATCH COMMUNITY CENTER					COMPUTER CALCULATIONS					
CHITECT/ENGINEER					CONTRACTOR BID					
	CLARK RICHARDSC	N & BI	SKUP		OTHER (SPECIFY) COMPUTED BY CHECKED BY					
ECO MEASURE				MAW		,	DEC			
	ENERGY EFFICIENT	MOIC	יחט			11174 11	L			
LICTOR	ENEDON CANDINGS									
MOTOR	ENERGY SAVINGS									
QUAN.	DESCRIPTION	HP	WATT	OPER.	SAVINGS	SAVINGS	INSTALLED		PAYBACK	
QUAIN.	DESCRIPTION	1 11	LOSS		PER YEAR	PER YEAR	COST	SIR	YEARS	
			SAVINGS		MBTU'S	DOLLARS		ļ		
<u> </u>			OAVIIVOO	1 = 7 11 1	1115100					
٠,	AHU FANS 1,2,3.	1.5	300	4380	13.5	\$209	\$1,326	1.7	6.4	
	A 10 1 A 140 1,2,0.	1.0	- 000							
1	AHU FAN 4	2	350	4380	5.2	\$81	\$466	1.9	5.7	
 	1711017114-1	_								
1	HEATING WTR PUMP	5	500	4380	7.5	\$116	\$644	2.0	5.6	
<u>'</u>	TILLY CONTROL OF THE CONTROL									
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TOTALS

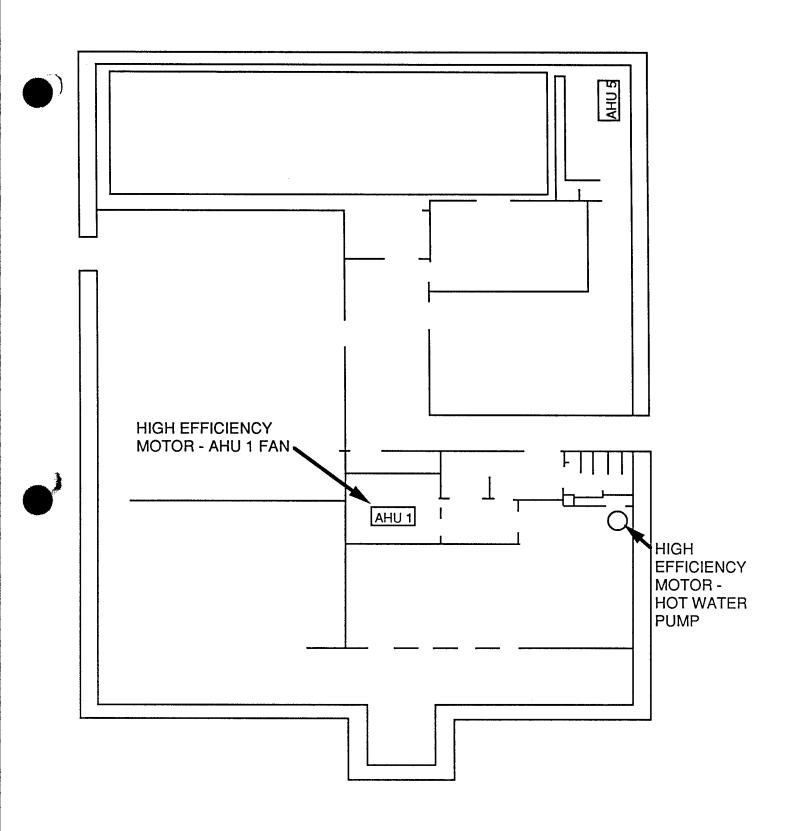
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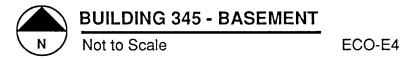
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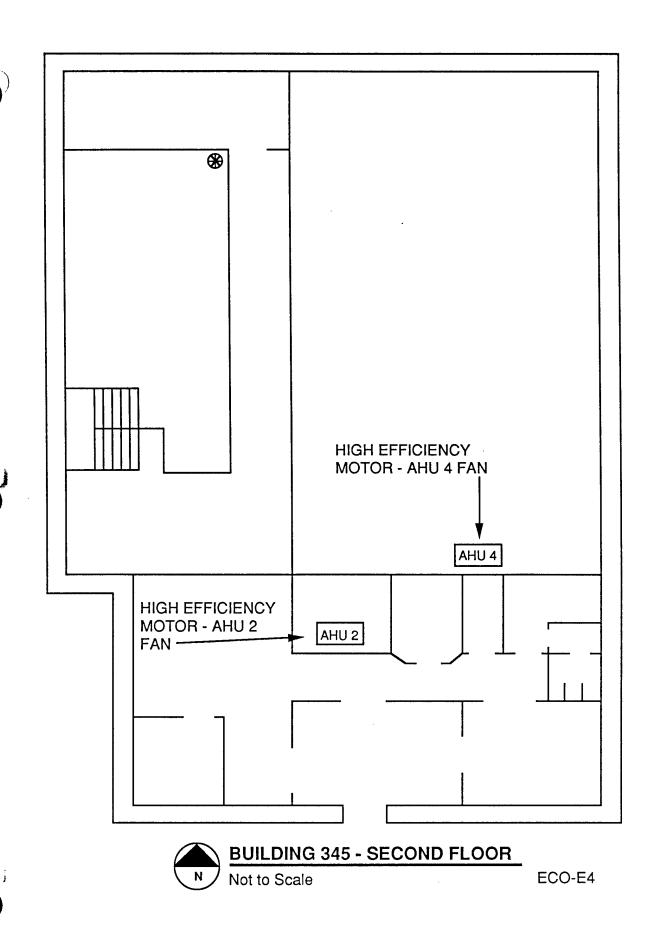
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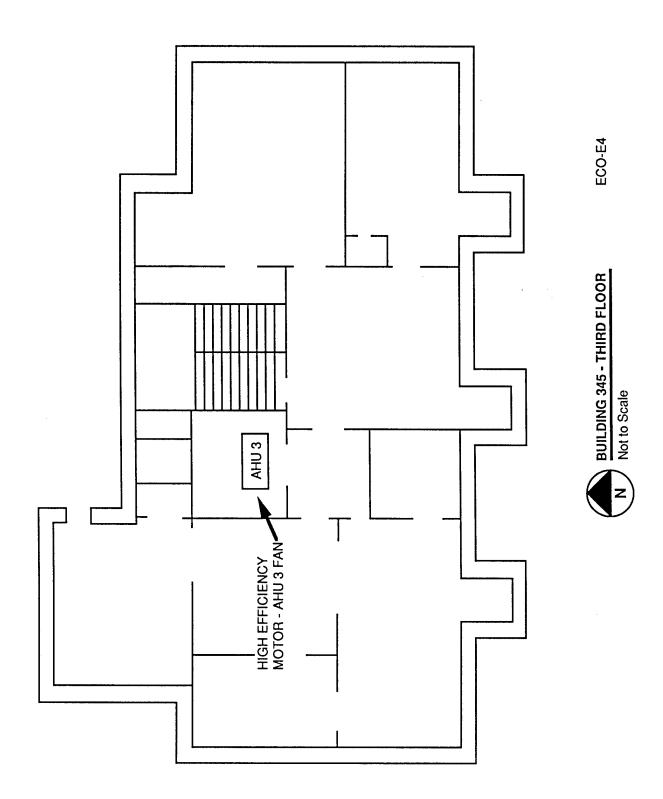
25 YEAR DISCOUNT FACTOR 11.05

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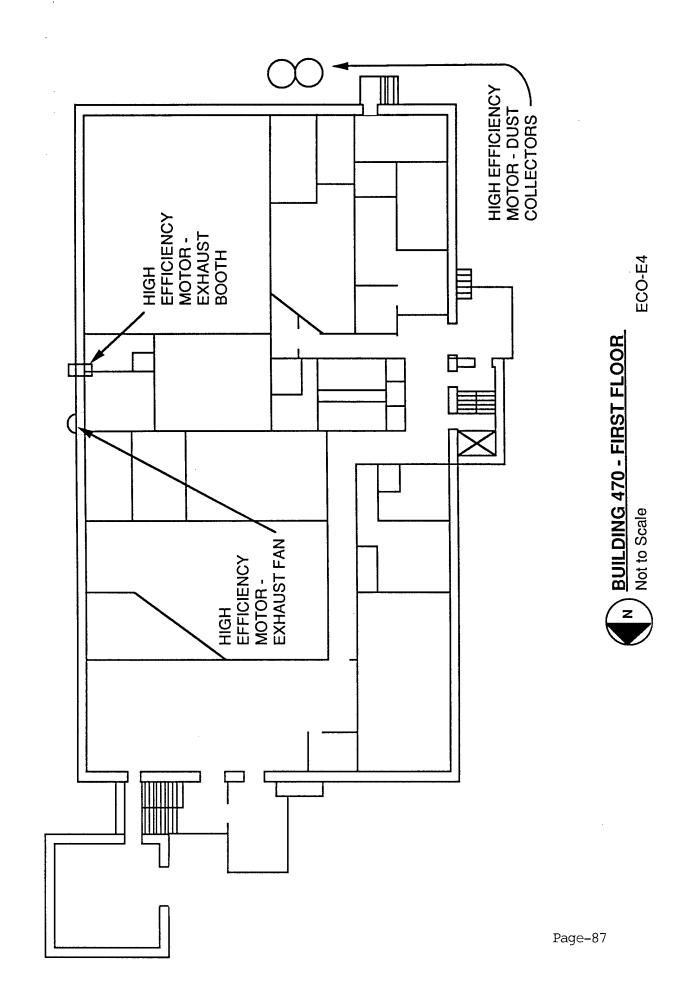


ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED		SHEET	OF
	7/10/87		11	11
PROJECFORT LEAVENWORTH ENERGY SAVINGS OPPORTUNITY SURVEY	BASIS FOR CALCULATION			
BUILDING 470 POPE HALL	X HAND CALCU		ONS	
CLARK RICHARDSON & BISKUP	CONTRACTOR OTHER (SPE	CIFY)		
ECO MEASURE ENERGY EFFICIENT MOTORS	COMPUTED BY C	HECKED B	Y	DEC

MOTOR ENERGY SAVINGS

QUAN.	DESCRIPTION	HP	WATT	OPER.	SAVINGS		INSTALLED		PAYBACK
			LOSS		PER YEAR		COST	SIR	YEARS
			SAVINGS	YEAR	MBTU'S	DOLLARS			
1	EXHAUST FAN	1	300	4380	4.5	\$70	\$420	1.8	6.0
1	EXHAUST BOOTH	5	500	4380	7.5	\$116	\$644	2.0	5.6
2	DUST COLLECTORS	15	1000	4380	29.9	\$463	\$2,510	2.0	5.4
				TOTALS	41.9	\$649	\$3,574	2.0	5.5

25 YEAR DISCOUNT FACTOR 11.05



	ENERGY SAVINGS	CALCUI	LATION :	SHEET	DATE PRE			SHEET	OF 2
PROJEC	FORT LEAVENWOR	тн			BASIS FOR	7/10/87 CALCULAT	ION	1	
	ENERGY SAVINGS	OPPOR	TUNITY		_				
OCATIO						HAND CALC	CALCULATIONS	ONE	
	USDB ECT/ENGINEER					CONTRACT		ONS	
	CLARK RICHARDSO	N & BI	SKUP			OTHER (S	PECIFY)		
ECO ME					COMPUTE		CHECKED B		DEC
······································	ENERGY EFFICIENT	мото	RS			MAW			DEC
MOTOR	ENERGY SAVINGS								
					[6444100	INOTAL LEDI		DAVDACK
QUAN.	DESCRIPTION	HP	WATT LOSS	OPER.	SAVINGS PER YEAR		INSTALLED COST	SIR	PAYBACK YEARS
		1	SAVINGS		MBTU'S	DOLLARS	0001	0	12,010
UTILITY	TUNNEL VENTILATION	SYSTEM							
				4000		\$93	\$582	1.8	6.3
1	EXHAUST FAN #1	3	400	4380	6.0	\$93	\$302	1.0	0.0
2	EXHAUST FAN #2 	2	350	4380	10.5	\$162	\$932	1.9	5.7
BUILDIN	IG #473								т
	D. D. D. #4	_	500	4380	7.5	\$116	\$644	2.0	5.6
1	PUMP #1	5	500	4360	7.5	Ψ110	044		
1	PUMP #2	3	400	4380	6.0	\$93	\$582	1.8	6.3
BUILDIN	IG #472	r	r		Τ	1	T	T	<u>,</u>
1	HOT WATER PUMP	з	350	4380	5.2	\$81	\$582	1.5	7.2
·	THO T WALLETT GAM.		1		<u> </u>				
BUILDIN	NG #467								
				4000	4.5	\$70	\$420	1.8	6.0
1	MUA #1	1	300	4380	4.5	\$70	5420	1.0	0,0
1	MUA #2	5	500	4380	7.5	\$116	\$644	2.0	5.6
BUILDIN	NG #466			, 			1	г	Τ
١ .	HEATING WTR PUMP	2	350	4380	5.2	\$81	\$466	1.9	5.7
<u>'</u>	THEATING WITH OWN		- 000						
1	AHU FAN MOTOR	5	500	4380	7.5	\$116	\$644	2.0	5.6
]					
		L	I						
			SHEE	T TOTALS	59.8	\$927	\$5,496	1.9	5.9
RE VE AL	P DISCOLINT EACTOR	11.05							

	ENERGY SAVINGS	CALCU	LATION S	SHEET	DATE PREI	7/10/87		SHEE!	O⊦ 2
ROJEC	FORT LEAVENWOR	тн			BASIS FOR	CALCULAT	ON		
	ENERGY SAVINGS		TUNITY						
CATI				}		HAND CALC		ONS	
RCHIT	USDB ECT/ENGINEER					CONTRACT		0110	
11 (01 11 1	CLARK RICHARDSO	N & BI	SKUP			OTHER (S			
CO ME	ASURE				COMPUTE	DBY MAW	CHECKED E		DEC
	ENERGY EFFICIENT	MOTO)KS			IVIAVV			DLO
MOTOR	ENERGY SAVINGS								
			· · · · · · · · · · · · · · · · · · ·				INIOTALLES	····	DAVDACK
QUAN.	DESCRIPTION	HP	WATT LOSS	OPER.	SAVINGS PER YEAR	SAVINGS PER YEAR	INSTALLED COST	SIR	PAYBACK YEARS
			SAVINGS		MBTU'S	DOLLARS			
) III DIA	IC #465							,	
	NG #465	-	050	4000	9.7	\$151	\$820	2.0	5.4
1	HOT WTR PUMP	7.5	650	4380					
1	AHU #1	2	350	4380	5.2	\$81	\$466	1.9	5.7
2	AHU #2 & #3	1	300	4380	9.0	\$139	\$840	1.8	6.0
1	CENTRIFUGAL PUMP	1.5	300	4380	4.5	\$70	\$442	1.7	6.4
			<u></u>		I	l	<u> </u>		
STEAM	& ELECTRIC PLANT	r		r	ı	1		1	<u> </u>
1	BOILER FEED PUMP	40	1700	4380	25.4	\$394	\$2,623	1.7	6.7
	FORCE DRAFT	10	800	4380	35.9	\$556	\$2,898	2.1	5.2
	FAN #1, #2, & #3 CONDENSATE	10	800	4300	00.0	1 0000	VE,000		
2	PUMP #1 & #2	10	800	4380	23.9	\$371	\$1,932	2.1	5.2
	AIR COMPRESSOR	3	400	4380	6.0	\$93	\$582	1.8	6.3
	1 AIR COMPRESSOR	25	1300	4380	19.4	\$301	\$1,780	1.9	5.9
	ITAIN COMPTICOCOT		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1	1	1	1		
	NG #472	<u> </u>			Ι		1	4.0	6.4
	1 AHU	1	300	4380	4.5	\$70	\$420	1.8	
	1 HOT WATER PUMP	3	400	4380	6.0	\$93	\$582	1.8	6.3
							<u> </u>		
			SHEE	T TOTALS	149.5	\$2,317	\$13,385	1.9	5.0
25 YEA	R DISCOUNT FACTOR	11.05	;						
5	• • •			USDB TOTAL	209.3	\$3,244	\$18,881	1.9	5.
A				IOIAL	200.0	1 50,237	1 0,0,001		

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: FTLVGRUP

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LCCID 1.001

INSTALLATION & LOCATION: FT LEAVENWORTH

REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

FISCAL YEAR 1987

DISCRETE PORTION NAME: GROUP 7

PREPARED BY: CRB ANALYSIS DATE: 07-10-87 ECONOMIC LIFE 25 YEARS

1.	INVESTMENT		
	A. CONSTRUCTION COST	\$	35589.
	B. SIOH	\$	3559.
	C. DESIGN COST	\$	1779.
	D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	36835.
	E. SALVAGE VALUE COST `	-\$	0.
	F. TOTAL INVESTMENT (1D-1E)	\$	36835.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL		JNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)		INUAL \$.VINGS(3)	DISCOUNT FACTOR(4)	COUNTED VINGS(5)
A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$	15.50 .00 .00 3.15 .00	332. 0. 0.	\$ \$ \$ \$ \$	5142. 0. 0. 0. 0.	11.05 16.73 17.67 19.36 13.47	56820. 0. 0. 0.
F. TOTAL			332.	\$	5142.		\$ 56820.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		\$ 0.
(1) DISCOUNT FACTOR (TABLE A) (2) DISCOUNTED SAVING/COST (3A X 3A1)	11.65	\$ 0.
(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$ 18/51.
A IF 3D1 IS = OR > 3C GO TO ITEM 4	
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=	
C IF 3D1B IS = > 1 GO TO ITEM 4	

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

5142. 4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))

56820. 5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

6. DISCOUNTED SAVINGS RATIO (SIR)=(5/1F)=1.54 (IF < 1 PROJECT DOES NOT QUALIFY)

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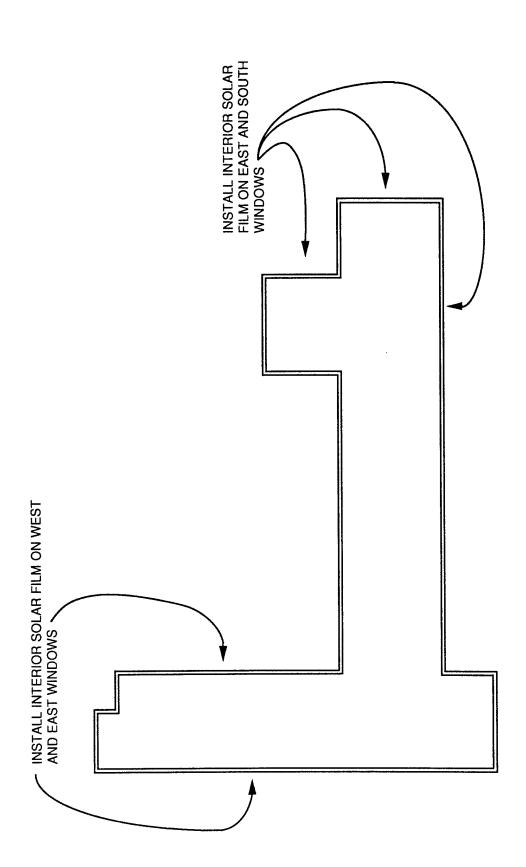
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ENERGY CONSERVATION ANALYSIS ESOS

PROJECT GROUP	ECC	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
GROUP 8 Building 225						
Building 225 Building 225	ECO-A4 ECO-M3	160.0 346.0	1	\$18,784 \$11,230	4.8 10.3	1.3
 GROUP 8 TOTALS		506.0		\$30,014	6.0	2.1

ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
PROJECT	BASIS FOR CALCULATION	
ESOS		UI ATIONO
LOCATION	HAND CALC	CALCULATIONS
FORT LEAVENWORTH RCHITECT/ENGINEER	CONTRACTO	
CLARK RICHARDSON & BISKUP		PECIFY) BIN METHOD
ECO MEASURE	COMPUTED BY DLH	CHECKED BY
BLDG. #225 A4 SOLAR FILM	1 UCI	
ENERGY SAVINGS		
EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER Y INSULATION BUILDING HEATING ENERGY USAGE (MBTU PE		MBTU MBTU
EXISTING BUILDING COOLING ENERGY USAGE (MBTU PER)	(R.) 1,077.00	
INSULATION BUILDING COOLING ENERGY USAGE (MBTU PE	R YR.)800.00	MBTU
MBTU'S SAVED PER YR. 207.00 MBTU		
HEATING MBTU'S SAVED / BOILER EFFICIENCY = TOTAL I -70.00 / 60% = -116.6	MBTU'S SAVED PER YEAR 7	
HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS -116.67 X \$3.15	PER MBTU = DOLLARS S = (\$368	AVED PER YEAR)
COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS 277.00 X \$15.50	PER MBTU = DOLLARS \$ = \$4,294	SAVED PER YEAR
ENERGY SAVINGS PER YEAR \$3,926		





	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
		7/10/87	1 1
PROJECT	FORT LEAVENWORTH	BASIS FOR CALCULA	TION
†	ENERGY SAVINGS OPPORTUNITY SURVEY		•
LOCATION			_CULATIONS
	BUILDING# 225	COMPUTE	R CALCULATIONS
ARCHITECT/E	NGINEER	CONTRAC	TOR BID
	CLARK RICHARDSON & BISKUP	OTHER	(SPECIFY)
ECO MEASUR	RE	COMPUTED BY	CHECKED BY
	BOILER OXYGEN TRIM CONTROL	MAW	DEC

BUILDING 225 - BOQ

TEST DATA, BOILER #1, KEWANEE FIRE TUBE, 125 HP

4,184,375 BTUH INPUT

% OXYGEN

8.%

STACK TEMPERATURE

245 ° F

% EXCESS AIR

58. %

EFFICIENCY

82.20%

%CO 2

7.6 %

BOILER WAS AT APPROXIMATELY 50% CAPACITY

BOILER OPERATED FULL TIME CYCLING APPROX. 50% ON 50% OFF.

BOILER TRIM CONTROL REDUCES EXCESS AIR TO 15%

FROM "GAS COMBUSTION EFFICIENCY CHART" PUBLISHED BY COOPERATIVE EXTENSION SERVICE, KANSAS STATE UNIVERSITY, MANHATTAN KS.

15% EXCESS AIR AT 317°F =

84.50% COMBUSTION EFF.

84.50%

82.20%

2.30% INCREASE IN COMB. EFF.

7 MONTHS /YR X 24 HRS/ DAY =

5000 HOURS OF OPERATION PER YEAR

ASSUMING BOILER OPERATES AT CONSTANT 50% OF PEAK

5000 4.185 MBTUH X 0.5 Χ

1 82.20% 10,462.50

10.462.50 MBTU/YR

12.728.10 MBTU/YR

10,462.50

84.50%

12,381.66 MBTU/YR

SAVINGS

12,728.10

12,381.66

346.44 MBTU/YR

3.15

Χ

346.44

\$1,091 PER YEAR



ECO-M3

LIFE CYCLE COST ANALYSIS SUMMARY **ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)**

STUDY: FTLVGRUP LCCID 1.001

INSTALLATION & LOCATION: FT LEAVENWORTH

REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061 FT LEAVENWORTH ESOS

FISCAL YEAR 1987	
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DISCRETE PORTION NAME: GROUP8

ANALYSIS DATE: 07-10-87

ECONOMIC LIFE 25 YEARS

PREPARED BY: CRB

1.	INVESTMENT		
	A. CONSTRUCTION COST	\$	27285.
	B. SIOH	\$	2729.
	C. DESIGN COST	\$	1364.
	D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	28240.
	E. SALVAGE VALUE COST	-\$	0.
	F. TOTAL INVESTMENT (1D-1E)	\$	28240.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL		JNIT COST J/MBTU(1)	SAVINGS MBTU/YR(2)		INUAL \$.VINGS(3)	DISCOUNT FACTOR(4)	 COUNTED VINGS(5)
A. ELECT B. DIST C. RESID D. NAT G E. COAL	\$ \$ \$ \$ \$ \$	15.50 .00 .00 3.15 .00	277. 0. 0. 229. 0.	\$ \$ \$ \$ \$ \$ \$	4296. 0. 0. 721. 0.	11.05 16.73 17.67 19.36 13.47	47469. 0. 0. 13965. 0.
F. TOTAL			506.	\$	5017.		\$ 61434.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		\$ 0.
(1) DISCOUNT FACTOR (TABLE A) (2) DISCOUNTED SAVING/COST (3A X 3A1)	11.65	\$ 0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)

D. PROJECT NON ENERGY QUALIFICATION TEST (4) DEG/ MAY NON ENERGY CALC (DEE V. 22)

(1) 25% MAX NON ENERGY CALC (2F5 X .33)	Ψ	20270.
A IF 3D1 IS = OR > 3C GO TO ITEM 4		
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=		
C IF 3D1B IS = > 1 GO TO ITEM 4		

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

5017. 4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))

61434. 5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

6. DISCOUNTED SAVINGS RATIO (IF < 1 PROJECT DOES NOT QUALIFY) (SIR)=(5/1F)=

2.18

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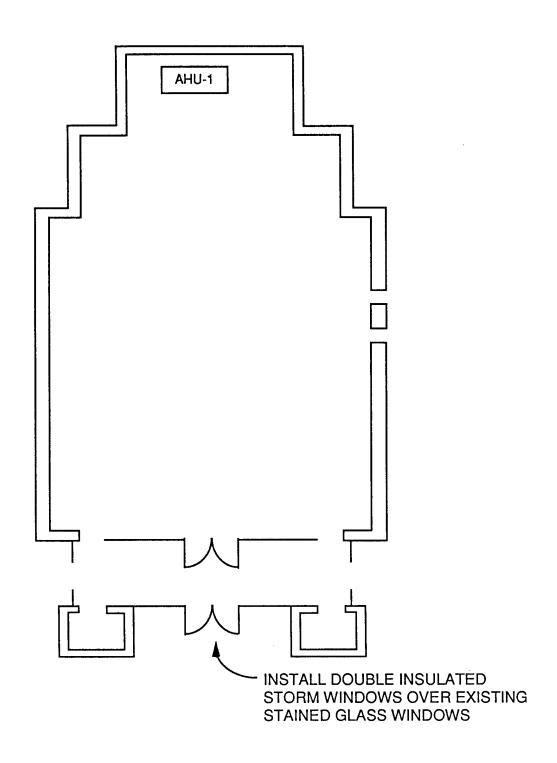
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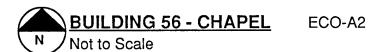
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ENERGY CONSERVATION ANALYSIS ESOS

	PROJECT GROUP	ECCO	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS \$	PROJECT COST \$	SIMPLE PAYBACK YRS	SIR
	GROUP 9 Building 56						
56	Building 56	ECO-A2	243.0	\$1,335	\$17,615	13.2	1.20
56	Building 56	ECO-A3	123.0	\$893	\$5,455	6.1	2.3
56	Building 56	ECO-A4	30.0	\$637	\$5,286	8.3	1.3
56	Building 56	ECO-A6	64.0	\$767	\$7,884	10.3	1.2
56	Building 56	ECO-E3	88.0	\$2,112	\$18,594	8.8	1.2
	GROUP 9 TOTALS		548.0	\$5,744	\$54,834	9.5	1.3

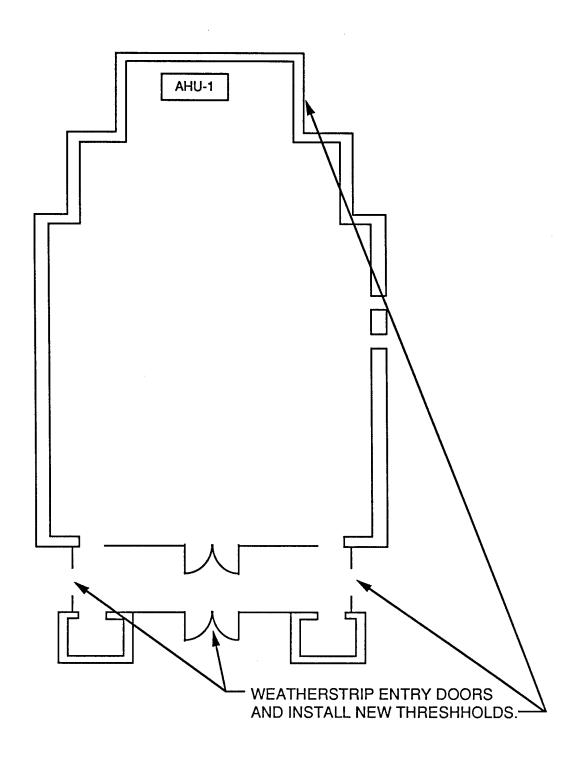
	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF
ROJECT		BASIS FOR CALCULA	
OCATION	ESOS	HAND CAL	CULATIONS
DOWE	FORT LEAVENWORTH T/ENGINEER	COMPUTE	R CALCULATIONS
HOHITE	CLARK RICHARDSON & BISKUP	X OTHER	(SPECIFY) BIN METHOL
CO MEA		COMPUTED BY	CHECKED BY
LDG. #	66 A-2 THERMOPANE GLASS] DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER	YR.) 3,167. R YR.) 2,970.	
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER		
	MBTU'S SAVED PER YR. 243.06 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS	S PER MBTU = DOLLARS	SAVED PER YEAR
	197.00 X \$3.15	= \$62	
	COOLING METHONYED DED VEAD A AVEDAGE DOLLARD	C DED MOTH DOLLADO	CAVED DED VEAD
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS 46.06 X \$15.50	5 PER MBTU = DOLLARS \$71	
	ENERGY SAVINGS PER YEAR \$1,334		
	CHEMICAL CHARLES TO THE CONTROL OF T		

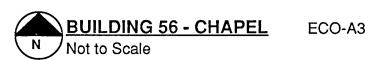


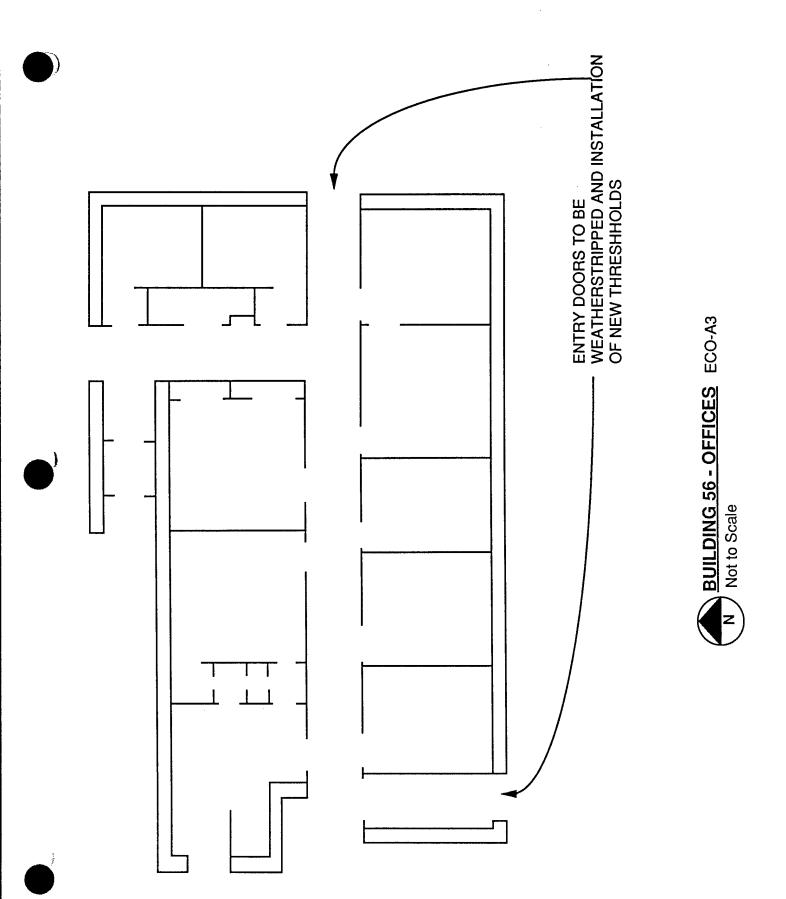


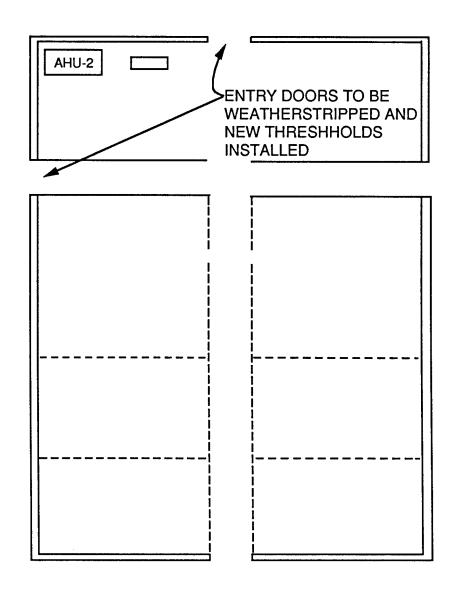
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	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF
PROJECT		BASIS FOR CALCULATION	L
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LOCATION		HAND CALCU	JLATIONS
	FORT LEAVENWORTH		CALCULATIONS
ARCHITEC	T/ENGINEER	CONTRACTO	
ECO MEAG	CLARK RICHARDSON & BISKUP	X OTHER (SP	ECIFY) BIN METHOD CHECKED BY
ECO MEAS BUILD #5	6 A3 WEATHERIZATON SAVINGS	DLH	ONEOKED BY
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YF MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER YF		
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YF	.) 417,025 a.) 405,035	
	MBTU'S SAVED PER YR. 122.92 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS P. 82.00 X \$3.15	ER MBTU = DOLLARS SA = \$258	AVED PER YEAR
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS P 40.92 X \$15.50	ER MBTU = DOLLARS S. = \$634	AVED PER YEAR
	ENERGY SAVINGS PER YEAR \$893		
	ENERGY SAVINGS FER TEAR \$695		
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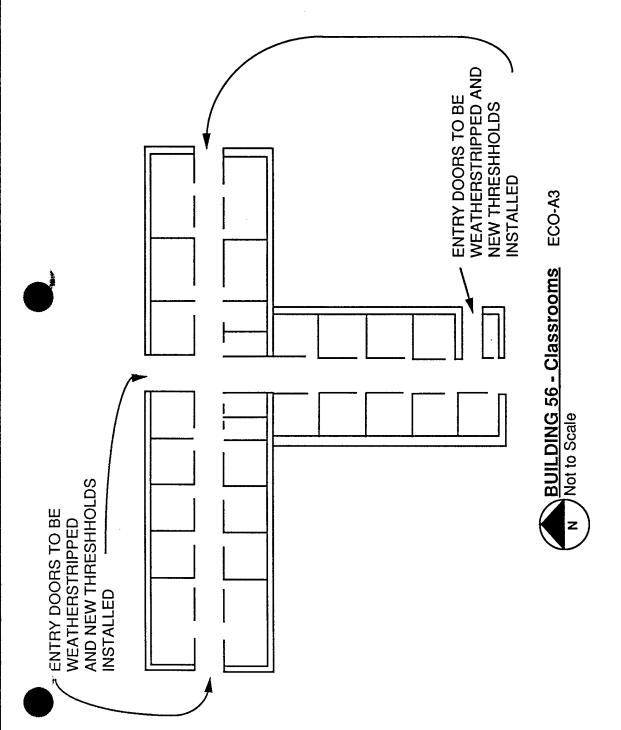




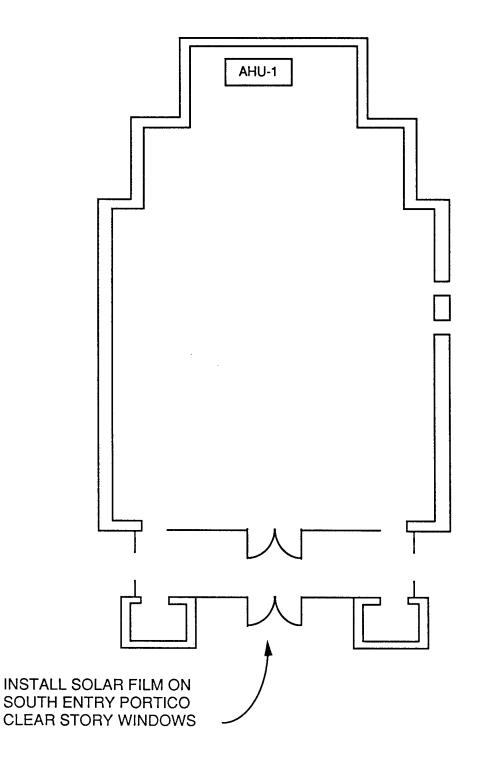


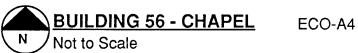


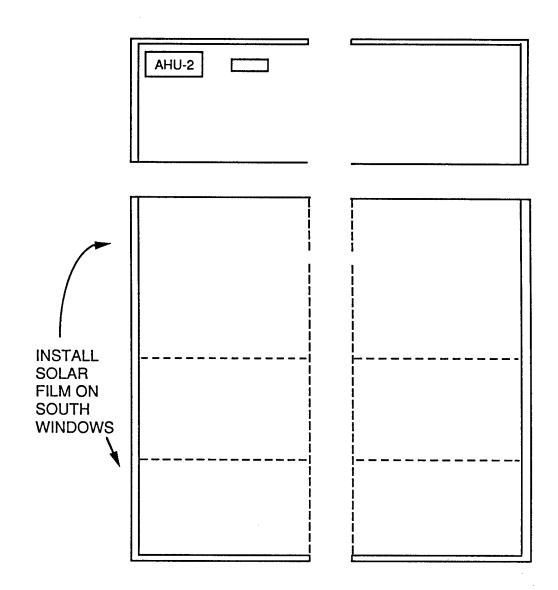


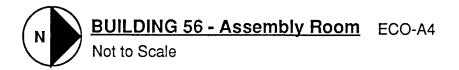


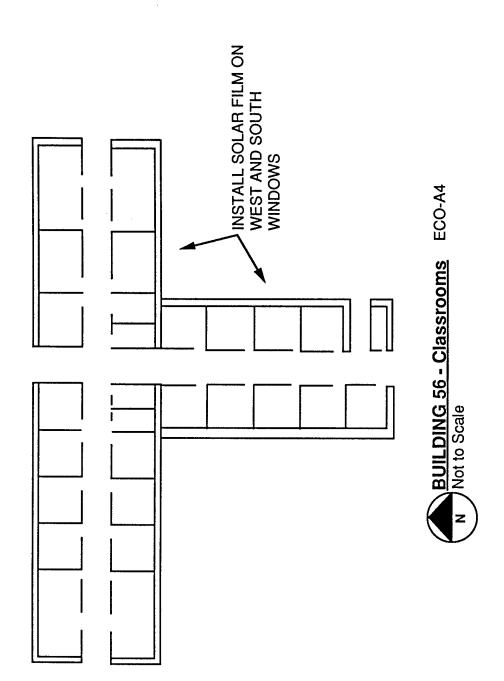
	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED	SHEET OF
		2/87 BASIS FOR CALCULATION	1 1
PROJECT	F000	BASIS FOR CALCULATIC	N
LOCATION	ESOS	HAND CALCU	JLATIONS
LOCATION	FORT LEAVENWORTH		CALCULATIONS
ARCHITEC	T/ENGINEER	CONTRACTO	
<i>-</i>	CLARK RICHARDSON & BISKUP		ECIFY) BIN METHOD
ECO MEAS	SURE	COMPUTED BY	CHECKED BY
BLDG. #5	6 A-4 SOLAR FILM SAVINGS	DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YF MODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER Y	R.) 3,167.61 R.) 3,181.55	
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YR MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YF	.) 417,025 R.) 404,152	
	MBTU'S SAVED PER YR. 30.00 MBTU		
	MBIUS SAVED FER IN OC.00 MBIO		
		ED MOTH DOLLARS S	AVED DED VEAD
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS P	= 0011ARS S $= ($44)$	AVED FER TEAR
	-13.94 X \$3.15	= (ψ++)	
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS F	PER MBTU = DOLLARS S	AVED PER YEAR
	43.94 X \$15.50	= \$681	
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	ENERGY SAVINGS PER YEAR \$637		
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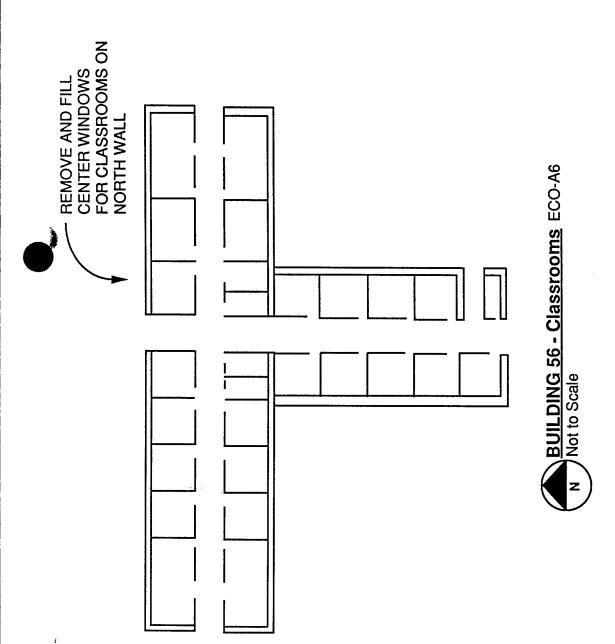








	ENERGY SAVINGS CALCULATION SHEET	DATE PREPARED 2/87	SHEET OF
ROJECT		BASIS FOR CALCULATI	ON
CATION	ESOS	HAND CALC	III ATIONS
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	CLARK RICHARDSON & BISKUP		PECIFY) BIN METHO
CO MEAS		COMPUTED BY	CHECKED BY
LDG. #5	6 A-6 REDUCE GLASS AREA SAVINGS	DLH	
	ENERGY SAVINGS		
	EXISTING BUILDING HEATING ENERGY USAGE (MBTU PER YIMODIFIED BUILDING HEATING ENERGY USAGE (MBTU PER Y		
	EXISTING BUILDING COOLING ENERGY USAGE (KWH PER YF MODIFIED BUILDING COOLING ENERGY USAGE (KWH PER YF		
	MBTU'S SAVED PER YR. 63.88 MBTU		
	HEATING MBTU SAVED PER YEAR X AVERAGE DOLLARS F	PER MRTH - DOLLARS S	SAVED PER YEAR
	18.09 X \$3.15	= \$57	
	COOLING MBTU SAVED PER YEAR X AVERAGE DOLLARS I	PER MRTU - DOLLARS	SAVED PER YEAR
	45.79 X \$15.50	= \$710	
	ENERGY SAVINGS PER YEAR \$767		
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ENERG	Y SAVINGS CALCUL	ATION SHEE	T	DATE PRE 2/87		SHEET 1	0F 1
PROJECT				BASIS FOI	R CALCULAT	ION	
ESOS LOCATION FORT L	EAVENWORTH			×	HAND CALC	R CALCULA	; TIONS
ARCHITECT/ENGIN CLARK	IEER RICHARDSON & BIS	SKUP				SPECIFY) B	IN METHOD
ECO MEASURE BLDG. :	56 E-3 REPLACE IN	ICANDESCEN	IT SAVINGS	COMPUTE	D BY DLH	CHECKE	
	Y SAVINGS						
EXISTIN MODIFI	IG BUILDING HEATI ED BUILDING HEATI	NG ENERGY ING ENERGY	USAGE (MBTU PEF USAGE (MBTU PEF	YR.) RYR.)	3,167.6 3,228.8		
EXISTII MODIFI	NG BUILDING ELECT ED BUILDING ELEC	RICAL ENER TRICAL ENER	GY USAGE (KWH P RGY USAGE (KWH F	ER YR.) PER YR.)	417,02 373,46		
MBTU'S	SAVED PER YR.	87.46 M	вти				
HEATIN	IG MBTU SAVED PE -61.22 X	R YEAR X A	VERAGE DOLLARS \$3.15	PER MBTU =	J = DOLLAR (\$19	IS SAVED P 3)	ER YEAR
ELECTI	RICAL MBTU SAVED 148.68 X	PER YEAR	X AVERAGE DOLLA \$15.50	ARS PER M =	BTU = DOL \$2,30	LARS SAVE	D PER YEAF
TENERG	Y SAVINGS PER YE	AR	\$2,112				

	ENERGY SAVINGS CALCULATION SHEET	IDATE PRE	PARED	SHEET OF
PROJECT			2/6/87 R CALCULAT	1 1
	ESOS	BASIS FUI		
LOCATION	FORT LEAVENWORTH	_x	COMPUTER	CULATIONS RICALCULATIONS
ARCHITECT/	ENGINEER		CONTRACT	OR BID
ECO MEASU	RE	COMPUTE		CHECKED BY
	E-3 INCANDESCENT REPLACEMENT SAVINGS		WBF	MAW
ECO MEASU	CLARK RICHARDSON & BISKUP RE E-3 INCANDESCENT REPLACEMENT SAVINGS BUILDING WATTS WERE REDUCED IN THE FOLLOWING LOC BUILDING #56 10926 TOTAL WATTS REDUCTION EXTERIOR - CHANGE 14 -100W CHANDELIER TO 40W. ENTRY VEST - CHANGE 9 -100W LAMPS TO 50W. KITCHEN - CHANGE 18 -100W LAMPS TO 90W. OFFICES - CHANGE 11 -100W LAMPS TO 90W. CHAPEL - CHANGE 12 - 100W LAMPS TO 90W. DRESSING RM - CHANGE 5 - 100W LAMPS TO 90W JANITOR - CHANGE 2 - 100W LAMPS TO 90W STORAGE - CHANGE 1 - 100W LAMPS TO 90W SOUTH ENT CHANGE 2 - 100W LAMPS TO 90W BAPTIS/CHAPLE FRONT - CHANGE 15 - 150W FLOOD LAMPS LOUNGE/ACT ROOM - CHANGE 36 - 150W FLOODS TO 55W. CORR./TOILETS - REPLACE 57 -100W INCAN. FIXTURES WITH	TO 120W.	OTHER (SED BY WBF	1290 W 1890 W 450 W 3420 W

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heat gain in the summer and heat losses in the winter. Weatherstripping doors and windows that are not replaced, will reduce infiltration and											l											
improve comfort. Solar film on windows not replaced. Will reduce solar											-											
heat gain in the summer. Reducing glass area by infilling some unnecessary																						
windows with insulated panels, will reduce solar heat gain and winter heat																						
	lo	sses	. Repla	<u>cin</u>	g	ir	ncar	ndesc	ent]	light:	ing v	wit	th l	ower	wat	cta	ge bul	b and f	luor	esc	ent	
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FORWARD TO KEYPUNCH AFTER COMPLETION
OF "APPROVAL ACTION" BLOCK

COMPLETION OF "FORWARD FOR APPROVAL" BLOCK

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LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: FTLVGRUP

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LCCID 1.001

INSTALLATION & LOCATION: FT LEAVENWORTH

REGION NO. 7

PROJECT NO. & TITLE: DACA41-86-C-0061

FT LEAVENWORTH ESOS

FISCAL YEAR 1987

ANALYSIS DATE: 07-10-87

DISCRETE PORTION NAME: GROUP9 ECONOMIC LIFE 25 YEARS

PREPARED BY: CRB

1.	INVESTMENT		
	A. CONSTRUCTION COST	\$	49849.
	B. SIOH	\$	4985.
	C. DESIGN COST	\$	2492.
	D. ENERGY CREDIT CALC (1A+1B+1C)X.9	\$	51594.
	E. SALVAGE VALUE COST `	-\$	0.
	F. TOTAL INVESTMENT (1D-1E)	\$	51594.

2. ENERGY SAVINGS (+) / COST (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST & DISCOUNTED SAVINGS

FUEL	INIT COST /MBTU(1)	SAVINGS MBTU/YR(2)	INUAL \$.VINGS(3)	DISCOUNT FACTOR(4)	OUNTED INGS(5)
A. ELECT	\$ 15.50	326.	\$ 5045.	11.05	55750.
B. DIST	\$.00	0.	\$ 0.	16.73	0.
C. RESID	\$.00	0.	\$ 0.	17.67	0.
D. NAT G	\$ 3.15	222.	\$ 699.	19.36	13526.
E. COAL	\$.00	0.	\$ 0.	13.47	0.
F. TOTAL		547.	\$ 5744.		\$ 69276.

3. NON ENERGY SAVINGS(+) / COST(-)

(1) DISCOUNT FACTOR (TABLE A) 11.65	A.	ANNUAL RECURRING (+/-)		\$ 0.
(2) DISCOUNTED SAVING/COST (3A X 3A1) \$		(1) DISCOUNT FACTOR (TABLE A) (2) DISCOUNTED SAVING/COST (3A X 3A1)	11.65	\$ 0.

0. C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) /COST(-) (3A2+3BD4)

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)	\$ 22861.
A IF 3D1 IS = OR > 3C GO TO ITEM 4	
B IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F)=	
C IF 3D1B IS = > 1 GO TO ITEM 4	

D IF 3D1B IS < 1 PROJECT DOES NOT QUALIFY

5744. 4. FIRST YEAR DOLLAR SAVINGS 2F3+3A+(3B1D/(YEARS ECONOMIC LIFE))

\$ 69276. 5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C)

1.34 6. DISCOUNTED SAVINGS RATIO (SIR)=(5/1F)=(IF < 1 PROJECT DOES NOT QUALIFY)